RIVER SHANNON NAVIGATION.

COPIES of a LETTER from the CHIEF SECRETARY of *Ireland*, respecting the RIVER SHANNON, and of ANSWERS to the same.

Ordered, by The House of Commons, *to be Printed,*
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SHANNON NAVIGATION.

LETTER from the Right Honourable *E. G. Stanley*, being INSTRUCTIONS to Colonel *John F. Burgoyne*, Chief Commissioner of the Board for the Promotion and Extension of Public Works in *Ireland*; with respect to the Improvement of the Navigation of the River *Shannon*.

Instructions to Col. Burgoyne, as to the Improvement of the Navigation of the Shannon.

SIR,

Irish Office, London, 18 October 1831.

HIS Majesty's Government having selected you as the Chief Commissioner of the Board about to be appointed for the promotion and extension of Public Works in Ireland, and a portion of the duties of that Board comprising those hitherto placed under the Board of Inland Navigation, I am to call your immediate attention to the allegations which are made of the extremely defective state of repair of the Works upon the Shannon, and the Canals and Cuts connected with it, which are under the management of the Government Commissioners. At the same time, however, that you turn your attention to these points, it is thought desirable by the Government that your inquiries should take a wider range, and should take within their scope the beneficial results which might be expected from a judicious expenditure of capital upon the River Shannon, both with reference to the improvement of its Navigation, and also to the reclaiming of vast tracts of land, now either inundated periodically by the floods of that river and its tributary streams, or rendered permanently incapable of cultivation from the accumulation of waters which are unable to find a vent. With the view of obtaining the most accurate information upon the subjects, His Majesty's Government have thought it expedient to join with you in a Commission Mr. Thomas Rhodes, civil engineer, and Commander William Mudge, Admiralty surveyor. When these gentlemen shall have joined you, you will proceed without loss of time to the West of Ireland, and will direct your attention to the following points, upon which you will, so soon as you can satisfactorily do so, report your opinion and observations to me, for the information of His Excellency the Lord Lieutenant:

1st. The existing state of these Works, Locks, Cuts, Canals, &c. which have been executed at the expense, and have been placed under the superintendence, of Government Commissioners.

2d. The manner in which the Grand Canal Company have fulfilled engagements, with regard to the maintenance of Works of a like nature, entered into by the Government, and for the superintendence of which the Government Commissioners are responsible.

Instructions to Col. Burgoyne, as to the Improvement of the Navigation of the Shannon.

3d. You will, after full consideration of the documents already in existence, and after personal inspection, report your opinion of the practicability and advantage of establishing such a control over the occasional floodings of the Shannon, as may tend to a beneficial drainage and reclaiming of the bogs and low lands through which it passes. You will state to what extent this operation might be carried, the general nature of the Works which would be required, and the probable expense to be incurred, taking care to connect with such a view the preservation of every advantage to be derived from the navigation of this great river.

4th. You will carefully examine and report upon the nature and extent of the obstacles at present existing to the navigation of the Shannon, whether arising from natural or artificial causes. Under the first head, you will consider the Shoals and Rocks which may occur, either in the River or the Lakes through which it passes between the falls of Doonass and its source; and under the second, all Mill-dams, Salmon-leaps, Eel-weirs, &c.; and you will state your opinion of the practicability, expediency and probable expense of removing any or all of these, and of the effect which such removal would have upon the general level and navigation of the river.

5th. You will make a similar inquiry respecting the navigation and capabilities of the River Suck and other waters connected with the Shannon, up to any great natural impediments to navigation.

6th. You will report your opinion of the practicability of carrying off the waters of Lough Allen by way of the Bay of Sligo, thus relieving the Shannon of an immense mass of surplus waters; of the probable expense of such a plan, if practicable, and of its effect upon the navigation of the Shannon, and the Harbour of Sligo.

7th. You will furnish me with such observations as you may make upon the nature and extent of the coal and iron mines on Lough Allen.

With reference to the principal objects contemplated in the above Instructions, I have to call your attention to the accompanying documents, bearing directly upon these points:

1st. The Memorial of the Earls Clanricarde and Clancarty, and the Report of Mr. Grantham in 1822. With regard to this document, however, you will observe, that the main object referred to Mr. Grantham's consideration, was not the improvement of the navigation, but the drainage of the adjacent lands.

2d. A Report of a Committee of Gentlemen interested in these objects, signed by the Marquis of Downshire as Chairman, in July of the present year, together with the various documents submitted to that Committee by Mr. Bermingham, Mr. Dixon Holmes, Mr. Stevenson, Mr. Williams, and others.

3d. A Letter from Mr. Grantham, explaining the circumstances under which the survey was originally made, and tendering his assistance in any re-survey which it may be thought desirable to undertake.

4th. Various Parliamentary Papers connected with the subjects of your inquiry.

You

Instructions to Col. Burgoyne, as to the Improvement of the Navigation of the Shannon.

You will of course avail yourself of the information which you may be able to obtain from Mr. Grantham, and also from Mr. Killaly, who will be able to furnish you with such useful assistance.

You will lose no time in commencing your inquiries, and will communicate with me from time to time the progress of your operations, for the information of His Excellency the Lord Lieutenant.

I am, Sir,
Your most obedient Servant,
(signed) *E. G. Stanley.*

P. S.—I also enclose you a letter, dated 14th May 1822, from Mr. Killaly to Mr. Grantham, with a sketch of the River Shannon, showing the several falls, canals, &c.

I.

LETTER from Colonel *Burgoyne* to the Right Honourable *E. G. Stanley*, Chief Secretary for *Ireland*, containing General Observations on the State of the Navigation of the *Shannon*, and describing the Plans of Improvement.

Office of Public Works, Dublin, 28th May 1832.

Sir,

General Observations on the Plans for improving the Shannon.

I HAVE the honour to transmit to you various Documents and Reports connected with the first stages of the examination of the River Shannon, according to the directions contained in your Letter of Instructions of the 18th of October 1831, a copy of which is annexed, marked (No. 1.)

In the nomination of the Commission for this object, I was aware that it was your intention, that while Capt. Mudge, R. N., and Thomas Rhodes, esq. civil engineer, should perform the active operations, I should be the medium of keeping the whole in one connected system, giving to the subject such opinions as a recent previous excursion up the river would allow, and such personal inspection and co-operation as might appear necessary, and as were consistent with my other avocations.

Under this view I submitted to those gentlemen, and obtained their concurrence in, a proposed general system (Nos. 2, 3, of the accompanying Papers) for the future proceedings.

In consideration of the great Ordnance and Maritime Survey of Ireland now in progress, and in order to save time and expense, it was understood that no extensive or minute surveys were to be undertaken, but simply such partial plans and sketches introduced, as should be necessary to explain the nature of the several points to be adverted to.

Nos. 4, 5, 6, 7, contain a series of Reports by Captain Mudge, on the present state of the navigation of the Shannon from Limerick to the sea; and of the Fergus from Ennis and Clare to its junction with the Shannon.

These very interesting Reports show the capabilities of those ports for trade, and explain with much minute detail the various obstructions and difficulties to be encountered in the passage up to them.

Captain Mudge may perhaps have overrated the facility with which many of these obstructions might be removed; still it is evident that very important improvements to the entrance of the port of Limerick might be effected at a trifling comparative expense; and it is probable that even others of a more extensive nature might be undertaken with every prospect of commensurate advantage to that city.

General Observations on the Plans for improving the Shannon.

It appears, however, that not only is very little or nothing done towards that end, but the channel of the river is liable to every kind of deterioration; ships may discharge ballast at any part without restriction, and the proprictors of adjoining lands may create any obstructions they please. No individual or body appears to have, or at least to exercise, any jurisdiction over this important line.

Considerable funds are raised from the shipping and trade of the port, but none of them applicable, it would appear, to the very desirable object of keeping open and improving the navigation.

For a great port, Limerick is too high up the river; had it been established at Foyns Island, all the principal disadvantages under which it labours would have disappeared, the interior system of communication would have commenced from thence, and few trading ports would have possessed so many advantages.

Considering this lower part of the river as a means of communication with the interior, several desirable improvements might be made by the formation of roads to the banks, and by the construction of small piers, quays, &c.: the principal points requiring such piers and quays are at Clare, Kilrush, Carrigaholt and Tarbert.

In No. 7, Captain Mudge adverts to the advantages presented at Clare and Ennis for the improvement of those places as ports. The principal requisite, as being of most easy accomplishment, is the construction of a landing quay at Clare; this, with a better road from the interior to communicate with it, are noted as so obviously required, that it would be surprising they have not been long since undertaken by the individuals most interested, but that there exists as yet but little opening for commercial enterprise in that quarter.

A communication to the sea from the magnificent interior basin extending from Clare to Ennis, is a very desirable undertaking. Several projects have been offered for that purpose, but none (that appear to have been thoroughly detailed and considered) for any estimated amount that could be raised for such an object.

No. 8 comprises the joint Report of Captain Mudge and Mr. Rhodes on the new Wellesley Bridge and Docks at Limerick, showing the nature of their construction, and the influence they may be expected to have on the port and navigation.

Nos. 9 and 10 contain the first and second Reports, by Mr. Rhodes, on the state of the Shannon between Limerick and Lough Derg at Killaloe.

Mr. Rhodes has entered into very minute examination and details of every point connected with the navigation of that portion of the river, as well as of the drainage of the adjoining lands; and he has offered many interesting and valuable suggestions for the improvements that may be effected.

The part of the river, the subject of those Reports, forming as it does a principal outlet to the whole of a very extensive interior water communication, has always been considered one of leading interest and importance.

In 1829 this navigation was given over by Government to a private association, called the Limerick Navigation Company, on their undertaking to expend 3,000 *l.* in the rebuilding of Ball's Bridge, which previously had interrupted the communication from the canal to the tidewaters of the river, and that they should keep the several works in repair; being allowed to divide to an amount not exceeding 10 per cent. upon their capital of 3,000 *l.*, the remainder of the tolls to be expended in the improvement of the navigation. These profits will be fully adequate to keep the existing works in good repair, and to make some slight improvements, but not to the extent recommended by Mr. Rhodes.

About the same period, a new and important impulse was given to the trade on the Shannon by the operations of the Inland Steam Navigation Company, amounting to what may be deemed a new resource for the internal industry of the bordering counties.

This trade is yet in its infancy, and well worthy of encouragement.

The facilities afforded by the tributary waters to the Shannon and its lakes for extended communication with the interior, have been so little required, and consequently

General Observations on the Plans for improving the Shannon.

consequently so little understood and developed, that what may almost be called discoveries, are now making daily of great existing capabilities.

Many of these communications, leading to important districts, might be made into efficient navigations at a small comparative expense. In other parts, the construction of small quays and landing-places, with roads to them, would be attended with great benefit.

These are works of general and public interest, but few present such advantages to individuals as to induce them to undertake them; they are therefore well worthy of any aid that Government can reasonably be expected to give them.

With regard to the question of the drainage of the lands on the borders of the Shannon above Lough Derg, Mr. Rhodes, it will be perceived, has suggested the construction of a dam at Killaloe of a convex figure, which will retain the waters at all times to a proper summer level, and at the same time well calculated (with the removal of eel-weirs and other obstructions) to carry off the floods with more rapidity.

Mr. Rhodes presumes that the head of water at Killaloe, which last winter was 9 feet above that required for the navigation, may be reduced to an extent that will seldom exceed 2 feet 6 inches.

The operation would be attended with a considerable expense; and the immediate effect, if limited to preventing the rise in Lough Derg, not attended with any very great advantage; but Mr. Rhodes's further investigations will show how far the benefits may be extended.

Should the project as at present laid down not prove sufficient, it is stated that the situation will admit of the opening or outlet being enlarged.

No. 11 is a Report on the state of the Portumna Bridge.

Portumna is at the head of Lough Derg, consequently at the spot where a communication across the Shannon first becomes practicable, after an interruption of 24 miles; the next being at Banagher, 7 miles still higher; it is therefore a point of great importance for a bridge.

In 1796, to establish this very desirable object, a Company was formed by Act of Parliament, and raised the necessary funds for the construction of a wooden bridge.

In 1818, a loan of 3,000 *l.* was obtained for its repair from the Consolidated Fund, on the security of the tolls; which proving insufficient for the repayment, a receiver was appointed at the demand of the Loan Fund Commissioners, and the receipts have thus become vested in the Government. The tolls are leased out, but are quite insufficient for the maintenance of the bridge: it is in the ruinous state described by Mr. Rhodes, and will soon be impassable, unless funds shall be provided by some means for its re-establishment.

The following Maps and Plans accompany the Reports:—

No. 1. Chart of the Shannon from Limerick to the Sea.
No. 2. Sketches of Tarbert, Kilrush and Carrigaholt.
No. 3. Chart of River Fergus, from Ennis to its junction with the Shannon.
No. 4. Sketch of the Fergus at the town of Clare.
No. 5. Wellesley Bridge and Dock at Limerick.
No. 6. Course of the Shannon from Limerick to Killaloo.
No. 7. Proposed Foot-bridge at Plassey.
No. 8. Proposed alteration at O'Brien's Bridge.
No. 9. The Parteen Rapid.
No. 10. Falls at Killaloe.
No. 11. Portumna Bridge.

I have the honour to be, Sir,
Your most obedient humble servant,
J. F. Burgoyne.

— No. 1. —

No. 1.
Instructions to Col. Burgoyne, as to the Improvement of the Navigation of the Shannon.

LETTER from the Right Honourable *E. G. Stanley*; being Instructions to Colonel *John F. Burgoyne*, Chief Commissioner of the Board for the Promotion and Extension of Public Works in *Ireland*; with respect to the Improvement of the Navigation of the River *Shannon*. *See* page 5.

—No. 2.—

General System for Proceedings.

LETTER from Colonel *John F. Burgoyne* to Captain *Mudge*, R. N.

No. 2.
General System for Proceedings:
Instructions to Capt. Mudge.

Dear Sir, Dublin, 7th November 1831.

Mr. Rhodes the civil engineer has arrived at this place, and as he is referred (as you were also) to the Instructions transmitted to me by Mr. Stanley, I think it is desirable that we should come to an understanding as to the objects of investigation for the different members of the Commission appointed to examine and report upon the River Shannon.

The subject seems to be divided into two leading divisions, for the inquiries and consideration of yourself, as a practical navigator and naval surveyor, and Mr. Rhodes, as a civil engineer.

The station to which I have been recently nominated is one that will require my habitual residence in Dublin; and so much attention, that it is only occasional assistance that I shall be able to give to the operations of this Commission, and more does not appear to be requisite.

Mr. Stanley's instructions, the documents which I laid before you, and our personal communication, have made you master of the general nature of the objects of the Commission: every species of information which you can obtain or supply, having reference to any part of those objects, you will of course contribute; but my idea is, that the points to which you may most usefully apply your researches, will comprehend the navigation of the wide waters, viz. from the sea to Limerick, and the lakes Derg, Ree, Forlees, Boffin, Boedaireg and Allen.

As regards the first portion, from the sea to Limerick, I presume that all that will be required will be to make such observations on the nature of the roadsteads, channels, shoals, and of the navigation in general, as can be collected from the existing charts, from inquiries of pilots and other persons well acquainted with the localities, and from a cursory personal inspection. It will be desirable to ascertain to what body belongs the charge of that navigation, and if any particular funds are allotted to it.

A more interesting subject of inquiry, as regards the present investigation, will be the facilities that exist or may be created for the internal trade of the country, by means of wharfs or basins, small streams or canals to the interior, as well as the points to which roads might with advantage be brought to the navigation.

Wherever upon consideration of your Report any works might be judged to be desirable, Mr. Rhodes will probably be employed to form the necessary plans and estimates.

Of Lough Derg and Lough Ree I can furnish you with printed charts, which I have reason to believe to be tolerably correct; a very beautiful one of the latter, on a large scale, from which the printed chart has been reduced, is in the possession of the Board of Public Works; of that, if you please, you shall be provided with a tracing. The points for investigation in those and the other lakes appear to be, the nature of their waters and prevailing winds, as regards their practical effects on sailing or steam navigation; a verification of the position of the shoals, and of the soundings of such parts of the shallow waters as have influence on the navigation, either in the general course across the lakes, No. 2. General System for Proceedings. Instructions to Capt. Mudge.

lakes, or into the different bays affording shelter or means of communication with the interior; an examination of the different bays and inlets, and tributary rivers, as far as they are or might be made usefully navigable without very considerable works, and a consideration of the wharfs, small harbours, or roads communicating to them that might be advantageously constructed.

I submit these propositions to you, subject to such modifications or alterations as you may think desirable; my object being to come to some agreement as to the mode of operation for carrying into effect the views of Government.

If you conceive that any part of what you would propose to undertake can be performed better by deferring it until summer, having reference also to your other employments, the Government would of course, on a representation being made to them, agree to such arrangement, particularly since the delay, as regards your operations, would be attended with little, if any, additional expense.

Dear Sir, yours very faithfully,

(signed) *J. F. Burgoyne.*

— No. 3. —

General System for Proceedings.

MEMORANDUM for *Thomas Rhodes*, Esq. Civil Engineer, dated 10th November 1831.

No. 3. Instructions to Mr Rhodes.

IN the examination of the Shannon about to be undertaken, the objects for Mr. Rhodes's consideration appear to be:

1st. The navigation of the river as well as that of the tributary waters, up to any great natural impediment in the latter.

2d. The practicability of draining in an efficient manner the lands subject to its winter and summer floods; and if deemed practicable, the general nature of the means to be employed for that purpose, and an idea of the expense, bearing in view that a thorough effective navigation at all seasons must on no account be abandoned.

With regard to the navigation, the Report required of its present state may be divided (exclusive of the three great lakes) into three portions:

1st. From the Harbour of Limerick to the entrance of Lough Derg, near Killaloe.

2d. From Lough Derg to Lough Ree.

3d. From Lough Ree to Lough Allen.

The two first portions are under the charge of the Limerick Navigation and Grand Canal Companies; with respect to them, the state of the several canals, locks, towing-paths, and other works connected with these navigations should be noted, with observations as to what is required to make them efficient at *all seasons*, to the extent to which those two Companies are bound by their several agreements with Government.

Such parts of the river as require improvements never yet executed will be subject to a more detailed Report, accompanied by plans and estimates for the works that may be deemed necessary. The difficulty that exists at O'Brien's Bridge, in times of the river being high, and the rapid at Parteen, may be considered as coming under this head.

The upper portion of the Shannon, viz. that between Lough Ree and Lough Allen, requires more particular investigation, as well because the impediments in that part have never been thoroughly removed, as that it is entirely in the hands of Government.

It will be desirable, therefore, that an account be drawn up of the present state of the canals, locks and other works, as well as of the shoals, rapids or other impediments on that part of the river, accompanied by Reports and Estimates

No. 3.
General System of Proceedings:
Instructions to Mr. Rhodes.

Estimates of what may be necessary to put the whole state of its navigation in an efficient state for all seasons of the year.

Another subject for examination on the point of the navigation is, that of the waters falling into the Shannon, which can be converted, at a small comparative expense, into useful lateral branches of communication into the interior: some of these have already been examined, an account of which will be given to Mr. Rhodes; of the remainder Reports will be required from him.

To consider the drainage, it will be necessary to ascertain by inquiries the extent and period of the floods, as well as the rate at which the river rises. A rough estimate may be formed of the accumulation of waters during the floods, the means that will be requisite to carry off what is superfluous, with a rapidity sufficient to be attended with such effect as the landowners and farmers require.

It is evident that the great key to any system of drainage must be at the falls of Killaloe.

It has been suggested, that by cutting down the upper part of those falls to a certain depth, the floods might be prevented by the additional vent given for the waters, and an increased extent of land be recovered along the shores of Lough Derg. In examining that scheme, it must be considered what will be the quality of the land that would be recovered from the lake; whether such a project would not certainly reduce the usual summer level, and lead to the necessity of lowering the whole navigation of the river above; and to what extent it would reduce the floods.

The only proposition likely to be beneficial, if it is practicable, appears to be to establish by lateral cuts, with sluices, a power of keeping down the height of the water to any desired level.

Mr. Rhodes, however, will have to take into consideration any plan which he may think likely to attain the end; in calculating the results he will of course allow for the effects which may be expected to be produced at Killaloe Bridge, and in the lower pents of the river, by the simultaneous fall of so much more water at times of flood than what has been usual.

I would recommend Mr. Rhodes very early to establish, through the means of the lock and toll-keepers at different points, such as the upper lock at Killaloe, bridge at Portumna, and the locks at Banagher and Athlone, a daily register of the height of the river, which may hereafter be of great service in calculating the rate and extent of the floods.

The practicability of draining off the superfluous waters from Lough Allen towards the north, into the Bay of Sligo, must also be investigated.

A good general map of the river, Mr. Grantham's report and sections, and various other interesting documents which can be furnished to Mr. Rhodes, will assist him in the various matters submitted to his investigation.

This time of year does not appear to be the most favourable for the investigation into which Mr. Rhodes is about to enter; but it is very desirable that he should witness and examine the winter floods, and by adapting his operations to the weather, there is a great mass of his labours that can be entered upon and performed during even the worst months.

As the Secretary of State requires for the information of the Lord Lieutenant occasional Reports of the proceedings of this Commission, Mr. Rhodes is requested to transmit from time to time to Colonel Burgoyne an account of the progress he has made in the inquiry, and to make him acquainted at all times with the place to which his letters should be directed to him.

Dublin,
10 November 1831. (signed) *J. F. Burgoyne.*

— No. 4. —

REPORT of Captain *Mudge*, on the present State of the Navigation of the Shannon from Limerick to the Sea.

No. 4.
Capt. Mudge's Report on the Navigation of the Shannon.

Sir, Limerick, December 10, 1831.

AFTER a careful examination of the Lower Shannon, I can with confidence submit the following Report upon the present state of the navigation from Limerick to the sea; and with it I subjoin such authentic information as I could acquire respecting the tolls and duties levied by the different local authorities upon vessels frequenting the port of Limerick; but it does not appear that there are any funds appropriated exclusively for the improvement of the navigation.

See Plan 1.

With respect to the former question, the navigation of the Shannon, the water is too shoal to permit vessels drawing more than three feet to lie afloat at low water, in mid-channel, above the Pool.

The water leaves the quays at the last quarter, and shipping alongside them are obliged to lie aground when discharging or loading. This is a difficulty that I see no other way of surmounting than by having a floating dock to receive vessels at high water; and it appears to have been so considered, for at the present moment there is a dock constructing of this description, which, when completed, will afford accommodation to a few vessels. But there will be great difficulty attending vessels entering this dock where it is at present constructing, for, on account of the river being shallow, a ship of 16 feet draught must be at the dock gates precisely at high water; and as a vessel drawing this quantity must anchor below Grass Island, which is nine miles from the city, to wait tide, it is obvious she can never be certain of arriving at the exact moment necessary for entering the gates, and if she fail in doing so, must remain outside and aground at low water, and thus the consequences which this dock was intended to obviate will of course ensue.

The only remedy will be found in a steam vessel, which should be ready to tow up shipping requiring to go into the dock; with this assistance, and provided the present works are well constructed, they would most likely answer all that may be required by the trade of Limerick for some years.

There should be at least eight mooring buoys laid down in the Pool for vessels to lie to, and so placed as to give the greatest accommodation. At present the free passage is impeded by warps run out to the shore, across the river, and vessels use their anchors to the great danger of others running upon them.

I am induced to believe, upon examination, that the river from the Wellesley Bridge to the Pool has somewhat less water than formerly; but all the way from thence to the Beeves, 16 miles below Limerick, it has deepened about four feet. The lessening of the water above the Pool is undoubtedly owing to the deposits caused by eddies and counter currents, which have been increased by the Wellesley Bridge. These eddies extend half a mile below the bridge, where the fair and straight current commences to run, and being then unobstructed in its course, the rapidity and force of the stream carries away all obstructions that have not a firm foundation: of these there are several, which from the narrowness of the river where they occur, impede the navigation so much, that it is only under very favourable circumstances of wind and tide that a vessel can proceed either up or down. To detail these several dangers will be my next endeavour, and to show in what manner the navigation may be improved.

I shall commence with the first impediment below Limerick, and continue my description to the sea.

In the accompanying Chart, at Kilriesk, a mile and a quarter below Limerick, will be seen a kind of bar, marked as running across the channel from side to side. This is called the Kilriesk Beg. It appears to be a ledge of rocks, a foul ground, mostly large flags of limestone, though I believe there are some knobs rising up two or three feet above the bed of the river On both sides of it the bottom is mud. The removal of this bar, or reducing it to a level with the bed of the river, would give vessels an opportunity of passing up an hour sooner, besides removing a danger which has proved destructive to more than

See Plan 1.

one vessel. The brig Amity, of Plymouth, Captain M'Kenzie, got upon this ledge; she received considerable damage; and after undergoing repairs, she sailed from Limerick with a cargo of wheat, bound to London, and has not since been heard of.

Two other vessels have met with similar accidents within these few years.

See Plan 12. Fig. 1.

The subjoined Diagram is intended to show the position of this shoal. There would not be much difficulty or expense attending the removal of this obstruction in the summer, when, at low water, there would not be more than four feet on the greater parts. I believe all the stones are loose, but as they are never uncovered, it would require the use of the diving bell.

See Plan 12. Fig. 2.

The next difficulty we meet with is the Cock Rock; but between this and Kilriesk Beg there is only one buoy to mark the channel, whereas there should be three others placed in the manner pointed out in the foregoing sketch. These buoys should be well and securely moored, so as to permit vessels to make fast a warp upon occasion. The Cock Rock is, I apprehend, one of the most serious difficulties a vessel has to encounter in her progress either up or down the Shannon. It is three miles below the city, in the Bight of Tiervoe, and runs nearly across to the opposite point of Cunoh. This rock contracts the channel so much, a vessel has not room to drop through till nearly last quarter flood, nor after first quarter ebb: with a falling tide and a foul wind a pilot ought never to take a vessel down past this rock; for if she were to touch on it, she would in all probability remain, to the great danger of bilging.

I examined this danger as well as circumstances would permit. It consists of large blocks of limestone lying under water; but I could not ascertain whether or not they were protuberances of a solid and fixed mass, or merely lying on the surface of the gravel bed. A considerable part of the loose stones that used to be exposed at low water have been removed at the expense of the Chamber of Commerce, and I believe the remainder of this rock might be taken away and made even with the bed of the river; but the use of the diving bell would be indispensable.

See ibid.

The shape and situation of this rock is shown in the accompanying sketch It runs out 140 fathoms from half-tide mark on the Tiervoe side over towards Cunoh; it is from 80 to 90 fathoms broad, and tapers away to a point, contracting the channel to 15 or 20 fathoms.

I cannot pass by this subject without strongly recommending that the Cock Rock and Bank should be entirely removed, if the expense would not be too much, which I do not believe it would; or that the protruding masses should be reduced; and I should recommend that a buoy be placed on each side, to mark the channel between the Cock and Cunoh Points.

From the Cock Rock the navigation is uninterrupted to Muckinish Point, having 2 ¾ fathoms in mid-channel, but there are two buoys required on the mud on the Milick side, opposite to the two that are now on the flat mud-spit extending off Muckinish Point, as shown in the sketch.

See ibid.

The Lady's Hole is a small oval space about 200 fathoms by 50, having three or four feet more water in it than is to be found in the vicinity. If six or eight mooring buoys were laid down here they would be found of great use for vessels to stop a tide, or when waiting for favourable circumstances to proceed to the quays.

The Ballast, a name generally applied by the pilots to all loose collections of stones; it is a patch of this description, lying on the mud a little to the northward of the Lady's Hole; they bare every tide; the deep water and channel lie close to them; and as they would injure a vessel if she were to get on them, I should advise their being taken away. This could be accomplished in two or or three tides, as they are all exposed at low water. A buoy, one of the two proposed above, should be placed where they are now, to mark the channel.

The Harrold's Rock is next in succession to the Ballast, and lies on the north bank about half a mile below Lady's Hole; it is about 60 feet long, and from 20 to 30 broad, and protrudes out from the mud about two-thirds of its length. It appears to be solid limestone, and rises about five feet above the mud in which it is situated. All this rock uncovers with every low spring. This rock is very much in the way of vessels, owing to the tide setting down the river directly upon it; therefore I should strongly recommend that it should be removed; and as the expense would not be anything considerable,

I think

I think the good derived would more than compensate. The subjoined sketch is intended to illustrate the position of this and some other rocks in this part of the channel. See Plan 12. Fig. 2.

Some foul ground and a sunken rock off Cratloe is the next danger we meet. The two castles of Cratloe, though in the same line, will take you on top of the sunken rock, on which there is barely three feet at low springs, but at half tide there will be from 11 to 12 feet; and as a vessel could not be so placed as to be in its vicinity before half tide, I think it would be sufficient to place a buoy on top of it. The stones on the bank should be taken away, and a part of it which appears to be solid would possibly require the use of powder to dislodge it.

The Kippen Rock is the sixth danger from Limerick, and I think, with the exception of the Cock Rock, it is the worst in the river, owing to the channel being contracted by the middle ground called the Whelps, and this rock running out directly towards it. It all uncovers at low water, and there are two fathoms alongside it. The Kippen might be removed without much trouble, and I believe a bell would not be required. There is a small tail or spit extending a few yards beyond it, but this the tide would soon disperse if the rock were removed. The advantage accruing from the removal of the Kippen would be, in the first place, widening the channel, so as to permit vessels to border more on the north shore, and thus keep clear of the spit of the Whelps; and in the second place, the tide would have a free and uninterrupted course down channel.

A quarter of a mile to the northward of the Kippen there is another cluster of limestone which should be taken away; it tends to contract the channel at half tide.

The Whelps are a cluster of seven solid limestone rocks protruding through the north end of a long sand bank or middle ground. This bank is half a mile in length, and consists of fine sand, and the whole bank indiscriminately called by the pilots 'the Whelps,' though I believe the name should apply properly to the seven rocks, which are in shape not unlike so many seals basking on the bank. They begin to appear a little after half ebb, and are four or five feet above the sand. The stones could be easily removed, as no part of them are under water the last hour of the ebb. By taking them away, it would considerably lessen the dangers of this part of the channel, which is narrow, and the tide runs with great velocity; besides, it would permit a vessel at half tide passing safely between them and the Scarlet. The channel between the Whelps and the north shore has 2½ fathoms in it, but the south channel is almost dry at low water, though vessels sometimes take the south side when tide and other circumstances are favourable.

There are six buoys required between Muckinish Point and the Whelps, and I should recommend them to be placed as follows: one where the Harrold Rock is now; a second opposite to it; a third on the sunken rock off Cratloe Castles, and the fourth opposite to it on the south side of the river; the fifth where the Kippen Rock is situated, and the sixth opposite to it on the south bank.

The Whelps require four buoys, one on each extremity, and one on each side, to mark the edge of the shoal on the channel sides.

There is a small patch of rocks that should be taken away, that lie on the north bank, nearly abreast of the centre of the Whelps; they are entirely exposed at low water, but in the event of the Harrold and Kippen, &c. being removed, they would become serious impediments while covered, as the tide would set down upon them, and strike from thence across the Whelps.

The Crawford Rock has been the cause of many disasters to the shipping frequenting the port of Limerick, and therefore should be removed; and as the greater part uncovers at low water, there would not be much difficulty in clearing it away.

Shawn-a-Garra lies a few yards lower down, and a little farther out than Crawford's Rock; it is seldom exposed at low water, and therefore very dangerous. By what I could make out from my personal examination, I believe it to consist of three or four knobs of limestone from five to six feet above the bottom; close to these rocks you will find four fathoms; if they could be removed by the bell I should recommend it to be done, but in the meantime a buoy should be placed near them.

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The tide sets directly upon the Shawn-a-Garra with great force; and with the present confined navigation, owing to the Whelps on one side, and this rock on the other, I can only wonder how so few accidents have occurred.

Plan 13. Fig. 1.

The Scarlets appear to be all rocks or large stones, and the greater part might be easily taken away; indeed the Chamber of Commerce, at their own expense, have cleared a great portion of the north tail, but there is much to be done, and I should strongly advise that a bell be employed to clear the stones and shingle away, the sand and mud may then be dredged out. The accompanying sketch of this shoal, and the tower on it, was taken by myself at low water.

Plan 13. Fig. 1.

Three buoys should be placed on this shoal: one on the north side opposite Greg Island; the second on the south side opposite Newton Point; and the third on the west end, as shown in the sketch; but in the event of any considerable portion of the shoal being taken away as I have recommended, of course this number of buoys will not be requisite, perhaps one would be all that would be necessary.

Plan 12. Fig. 2.

Greg Island will be seen in the preceding sketch to lie on the north side of the channel opposite to the Scarlets; from off this Island a ledge of rocks and stones extends some yards, and I should advise that they be taken away; it would considerably improve the navigation, and lessen a great deal the danger of the north channel. The tail of Greg Island should have a buoy on it, as the tide sets very strongly on the point.

There are two or three patches of loose stones lying on the bank opposite the Scarlets, and abreast of the Whelps, which ought to be removed; this may be done with the greatest facility, as they are of small dimensions, and uncover every low water.

The Slate Rock lies next to Greg Island, and is in the centre of the channel; it is nearly round, and about 20 feet in diameter. There is seldom less than three feet on it at low springs, though I am told it has occasionally been seen at the surface of the water. It should be removed; and from the smallness of it, and being composed of loose stone, the greater part could be easily taken up, though it would require the use of a diving bell, as indeed would almost all the dangers I have enumerated. A small bank, with a swashway through it, continues all the way to the Hogshead Rock.

This rock is a very serious obstruction; it uncovers every tide, and I think the greater part is solid limestone; but some portion being merely loose stones and coarse shingle, I think it would not cause much expense, nor would there be much difficulty, in clearing it away. The bank, or rather the collection of sand and mud caused by these two rocks, would soon be dispersed when unprotected by them.

This part of the channel is a quarter of a mile broad, and lies on the south side, where there is 2 ½, and three fathoms water at low springs. There have been two or three vessels damaged on these rocks.

The mud flat, off Bush Island, ought to be buoyed, and a patch of stony ground should be taken off the mud flat in the bight opposite the Hogshead, and a buoy placed there to mark the channel.

Plan 13. Fig. 2.

The accompanying sketch is intended to illustrate the foregoing description from the Scarlets and Greg Island to Grass Island.

It will be seen that the channel winds round the south side of Battle Island. There is a small swashway on the north side, but very little water in it at low tides. Off the tail of Battle Island it is quite flat, and runs out in a long spit towards the Hogshead; between them there are 2 ½ fathoms. This spit should be dredged out, and all the stones should be taken away, and piled on top of the island, for though of considerable size it is almost covered in the winter season at high water. The west side of Battle Island is very shoal, and dries almost all the way to Laheen's Rock; the stones should be taken up, and put on the top of Battle Island.

Laheen's Rock lies on the very edge of the shoal, and the tide sweeps past it with great velocity. There are 15 fathoms close to the rock. This danger should be entirely removed; and I am sure it will be found well worth the expense. It now not only contracts the passage between Battle and Grass Islands to 70 or 80 fathoms, but it is in itself very dangerous from being nearly steep; for a vessel might strike upon it half tide, and then fall over on the deep side, which in all probability would cause her to fill and go down.

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Grass Island is rather bold on the Laheen side, but from off the west side a spit extends towards the mud bank of the River Maig, which should be cleared to give a wider passage into that river; and a few loose rocks should be taken from the mud flat on the west side of the Maig. A little to the north-west of this, off Key Island, there is tolerable good anchorage, in four fathoms, and it only requires six or eight mooring buoys to be laid down to render it a very useful anchorage for vessels going to the docks, or obliged to remain to wait an opportunity of proceeding up to Limerick.

From Grass Island the navigation is unobstructed for a mile, down to the Big Bird, upon which the tide sets with all its force. This rock almost blocks up the north channel, formed by Sod Island, and the extensive shoal or middle ground extending more than three miles to the westward of it.

The Big Bird shows every tide; it is solid limestone, and about 12 fathoms in diameter, and a spit extends from it to north-west, and another to the south-east, but these are merely formed by the eddies, and when the rock is taken away the sand will soon be dissipated by the tide. By the removal of the Big Bird a serious danger will be destroyed, and a fair and better channel thrown open; but to make it secure several buoys should be placed in the following manner: one on each side of Sod Island, and one on the mud off Tradee, one on the extreme of Saints' Island, opposite to Sod Island, a fifth off the point of Great Limerick, another off the Bridge Rock, the seventh off the Little Limerick, and two others, one off Durnish Island, and the other opposite to it, on the tail of Carrickoclouch Rock, being nine altogether; but many of these may be dispensed with, provided some of the rocks, which I shall name, are removed: the least water in this channel is from 12 to 14 feet.

The Middle Bank, as before mentioned as extending from Sod Island, lies in the centre of the river, and forms two channels, one called the North Channel and the other South; but the latter is the only one used at present, owing to the difficulties presented by the Big Bird almost blocking up the entrance to the other. On this middle ground, which is, I believe, chiefly composed of fine sand, there are situated four rocks, being nearly three quarters of a mile from each other; they are of limestone, and are entirely exposed to view at low water; they are called the Sand Rock, Bridge Rock, Small Limerick, and Carrickoclouch Rock, and are the same I pointed out as necessary to be marked by buoys, to make the North Channel navigable, in the event of the Big Bird being removed.

I do strongly recommend all these rocks being taken away; for, in the first place, vessels would then cross over the middle ground at three-quarters flood, and smaller vessels at half tide, and fewer buoys would be necessary; three upon the whole bank would be sufficient.

The South Channel, which at present is the only one used, is very shoal about mid-way, not having more than six or nine feet at low water; and there are two rocks or shoals lying in the middle of the passage: a cluster of five, called the South Bridges, and another called the Small Rock. The South Bridges, if not removed, should be cleared as much as possible of stones, &c., so that vessels getting upon them would not receive any material damage; and three buoys placed to mark the limits of the sand, one at each extreme, and one on the north side: but I think, the greater part of the rocks and stones being removed, one buoy would answer all purposes.

The Small Rock could be easily taken up, and the sand at present collected would be swept away by the tide. I am told that the pilots will occasionally, when near high water, take a vessel to the south of the Bridges, between them and the Point of Ringmoyland; but at low water, in dry seasons, it is fordable across.

Gullivan's Rock lies opposite Sod Island, on the south mud, and ought to be taken away; it uncovers every tide. I should advise that three buoys are laid down in this channel; one on the mud near Gullivan's Rock, another near the Bridge Rock on the south side of the Middle Ground, and a third on the extreme spit of the Middle Ground; this latter in two fathoms at low water. The accompanying sketch is from Grass Island to Behey Castle. Plan 14. Fig. 1.

From the tail of the Middle Ground to the Beeves, a distance of three miles, the navigation is not impeded; the depth of water from five to six fathoms.

The Beeves are three large masses of limestone, and the centre one is the largest, on which there is a tower about 36 feet high and 20 feet diameter; the walls

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walls are near upon five feet thick, and the only thing requisite to convert it into a lighthouse would be merely opening a communication through the arched roof, with a lantern, that might be easily placed on the top. The chamber in the tower could be fitted up for the accommodation of the keeper, and a small storehouse constructed on shore at Ballistync Point, to lodge the stores. Three weeks or a month's consumption could always be kept in the tower. I cannot too strongly recommend that a light should be placed on the Beeves; it will enable a vessel outward bound to take advantage of a few hours spurts of easterly winds at night-time to start from Grass Island, and by that means may possibly prevent the detention of many weeks. Westerly winds prevail here nine months out of the twelve, and when once set in, continue six or seven weeks uninterruptedly; and as they generally blow with violence, it is seldom a vessel will attempt to work against them: detention of this kind is a sad hamper to commerce, and as it may in many instances be obviated by having a light on the Beeves, I do most strongly recommend it to your notice; indeed I consider it one of the greatest improvements that can be made in this river, for even vessels homeward bound would be able to sail in from sea up to Grass Island at night, or take advantage of a fair wind, that might last a few hours; for large vessels should have a leading wind to take them up the narrows to the quays. The Beeves Light would be particularly well placed for facilitating the navigation of the river; for this tower, kept open on either side of the shore, is a leading mark down, or from Tarbert upwards; and by keeping the light in sight, you cannot get upon the Bowline Rock, near Tarbert, so that this part of the channel would be as easily traversed by night as by day. There is now a light building on the Point of Tarbert, which, with the light of Kilkadrane and the one I have proposed on the Beeves, will complete the connexion for 40 miles, and render this much of the river quite as safe by night as in the day. It would be of great assistance for vessels bound out of the Fergus, and would enable them to sail at all hours to or from the anchorages in the river.

Plan 14. Fig. 2.

The sketch subjoined shows the position of the Beeves, and of the tower on the centre one. It will be seen that there is not any regular channel between them at all times of tide; but under some circumstances, a vessel can pass between the northern Beeves and the tower.

The Herring Rock lies a mile and a half to the westward of the Beeves Tower, on a mud spit off Echinish Point. There should be a buoy placed near it, as the tide sets strong on the rock; and with a working wind, either up or down, it is desirable a vessel should be warned of her proximity.

A small rock off Carigfoda Castle, nearly opposite to Labasheda Bay, should be marked with a buoy; it lies nearly half a mile from the land, on a mud flat. Labasheda Bay is the best anchorage in the Shannon, the bottom generally mud; any number of vessels can stop here, in from six to seven fathoms water.

The Bowline Rock is the next danger; it lies half a mile from the Clare shore, nearly abreast of Tarbert; there are four fathoms close to it; more than 70 fathoms of it bares with summer tide: it is considerably in the way of vessels working either up or down the river with a contrary wind, and the best thing to be done would be to erect a substantial beacon upon it: this might be easily and cheaply performed, as there are plenty of fine quarries within two or three miles of it.

Tarbert has a tolerable bay, where shipping remain when waiting for a favourable wind to put to sea; but the bank is very steep, so that vessels often drag their anchors off, and are obliged to run for Labasheda Bay; but when vessels are well provided with good ground tackle, I see no reason why they should at any time drift from their anchorage. When the lighthouse on the Point of Tarbert is completed, I think it will be found a fine safety harbour, where vessels may run for at any time of the night from the outward anchorages at Carrigaholt or Scattery. A small pier is much wanting at Tarbert, and the trade would seem to warrant such an undertaking.

Clanderlaw Bay lies opposite to Tarbert; it is open, and an insecure roadstead; there is a small creek in the bottom of the bay, in which the tide flows up to the village of Kilmurry, where there is a small pier built for the convenience of boats shipping grain to Limerick. This appears to be insufficient, but I do not conceive any money could be expended judiciously at Clanderlaw. Should it be thought advisable to do anything to assist the export of grain from

this

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this place, I should, in preference to increasing this pier, recommend a road across to Labasheda; the distance is a mile and a half, to a secure port available at all times.

Rinana Shoal, off Scattery, has barely 12 feet at low water on the shoalest part; it lies nearly north and south, half a mile in length, and has a passage with seven fathoms water between it and Scattery. There should be a buoy placed on each extreme.

Carigue Shoal lies a mile north of the point of Carigue Island, and should also have a buoy on the north extreme of it. There is merely a boat passage between it and the low water.

Scattery Island has a very good road-stead on its west side, and shipping with good ground tackle will always find shelter with the wind from the westward or northward, but with a southerly wind it is much exposed: off the north side of Scattery a spit extends half a mile in a semicircular form, terminated by a rock; the end of this rock should have a buoy placed on it.

The Bale Bar is the only remaining danger I have not mentioned: this is a very dangerous shoal, it extends off from Bale Point nearly three quarters of a mile north of it, and beyond that the water is shallow for half a mile; this edge of the shoal should be marked by a buoy, and it ought to be well and securely moored. The land-marks for avoiding this danger are very good, viz. "Kilkadrane Point, just closing upon Kilclochar Head," but there are times, indeed generally with southerly winds, that the weather is too hazy for seeing these marks when more than a mile or two distant; at such times a buoy on the Bale would be most appreciated.

Carrigaholt Bay lies opposite the Bale; it is a fine and secure anchorage with the wind to the northward of west, but with south-west winds, and these accompanied by the "rollers," it is not safe to lie there. It has been proposed to construct a break-water from Kilkadrane Point, so as to form an asylum harbour, but the expense of such an undertaking would be enormous, and I am confident the trade of Limerick will not be of that nature to authorize such an undertaking for many years. The extension of a small pier at present existing in the inner bay of Carrigaholt, would I think be judicious, but I should not advise any large sum to be expended upon a refuge harbour, although I know it to be strenuously advocated by men whose opinions are entitled to respect.

All to the westward of the Bale and Carrigaholt may be considered as the ocean, for the two head-lands of Kerry and Seophead form a bay entirely open to the sea; but near Dunmore Head there is a small pier harbour, which affords accommodation to some few boats carrying corn to Limerick, and I believe is considered of great service to the small farmers in that neighbourhood.

In concluding this Report of the Navigation of the Shannon, and the improvements I have recommended, by clearing some of the rocks and shoals, and placing beacons on others, I should most strenuously advise that some plan be adopted to keep any works that may be undertaken in a state of repair. At present there are no funds appropriated for the maintenance of the navigation, although the collections amount to a considerable sum. It will be seen from the accompanying documents that not more than 75 *l.* are expended annually, and that is merely keeping up a few buoys on some of the shoals; there are at present 15 down, and some of these have been placed on the shoals since my arrival here. The principal part of those that are now down are of too small a description, and they are so easily removed that the country people steal them at night for the sake of the iron. All the buoys that are put down in this river should be moored with 10-inch chain cables, and 25-cwt. anchors; the difficulty attending unshackling the bridle of such moorings would be an effectual security against theft.

The quays of Limerick are at present in a very deplorable and wretched condition; the ground around them on which vessels lie, instead of being made smooth and even, is rugged and hard, so that vessels are continually receiving damage, and this from thorough negligence: and though these quays are private property, yet the Corporation of Limerick receive dues for the quays just the same as if they were the property of that body; therefore it would seem but fair the money so collected should be appropriated to the improvement of the river: but out of 1,100 *l.* levied every year by the water bailiff, an officer appointed by the Corporation, not one farthing of this money is accounted for in any way.

The

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The following statement of the port dues and collections made in the port of Limerick, are from the most authentic information I can obtain, and I believe to be nearly correct.

There are three corporate bodies in Limerick having an interest in the navigation of the Shannon.

The first is the Chamber of Commerce, consisting of opulent and the most respectable merchants, whose funds have gone far towards making all the improvements the navigation has received; they have no right or control over the river in any way.

The second is the City Corporation; they appoint a water bailiff, whose business it appears is to levy the following taxes upon all vessels arriving at the port of Limerick:

	s.	d.
Every vessel anchoring at the Pool - - - -	6	6
Every vessel going to the quays - - - - -	7	6
Ballast taken in or discharged from any vessel, per ton -	–	2
All boats laden with turf - - - - - -	–	6
All boats laden with grain or any saleable commodity -	–	6

In the year 1830, 423 vessels sailed from the quays, whose united registers were 52,326 tons. The profits arising from these vessels to the water bailiff was 710*l.*; and 600 small craft making 30 trips per annum, will be 450*l.*; so that the fees were not less than 1,150*l.* in 1830. This sum is not accounted for, beyond keeping up 15 buoys upon the shoals, and five warping-buoys, and the expense of these is less than 75 *l.* per annum.

Independent of these dues there are other taxes imposed by the Corporation, which are farmed out, this year to Mr. Gibson for the sum of 865*l.* These are levied upon the following articles brought to the quays in the country boats:

	£.	s.	d.
Every cask of butter - - - - - -	–	–	1
Winchester barrel of corn, peas, potatoes, &c. -	–	–	– ½
Every 100 pounds weight of feathers - - -	1	–	–
Every 100 of dried ling or cod - - - -	–	–	4
Every pack of wool - - - - - -	–	–	3
Every pocket ditto - - - - - -	–	–	1 ½
Pigs, dead or alive - - - - - -	–	–	– ½
Oysters per car load - - - - - -	–	3	–
Every dozen of sheep or goat skins - - -	–	1	–
Every ox hide - - - - - - -	–	1	–
Every load of calf skins above three dozen - -	–	4	–
Every dozen under three dozen - - - -	–	1	–
Every chest of merchandize - - - - -	–	4	–
Every chest of tea - - - - - -	–	4	–
Every ship of coals, two Bristol barrels - - -	–	1	–
Every dozen of stockings - - - - -	–	1	–
Every pack of worsted or woollen yarn - - -	–	4	–
Every box of eggs - - - - - -	–	3	–

The third body consist of the Commissioners appointed in 1823 by Act of Parliament, with power to levy certain taxes for the erection of a bridge and docks to accommodate sharp vessels frequenting the port of Limerick. The present returns average about 1,500*l.* per annum. These Commissioners have also jurisdiction over the pilotage of the river, and no person can act as a pilot without their authority.

This is a subject worthy the consideration of the Government; for although there are regulations established by the Commissioners, yet there does not appear to be any examination touching the qualification of the candidates previous to their being constituted regular pilots, and the mischief of this is that the greater part of these people are not seamen; and although they may know the situation of a danger, they have not the practical knowledge of a seaman to work a vessel under difficult circumstances, a time when a pilot is most needed. The only remedy for this evil is to place all the pilots under the control of the Ballast-office in Dublin, who are themselves under the Trinity Board; they well know how to arrange these matters; and their pilot regulations are so good and strict

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strict, that I am confident we should soon see a class of pilots in Limerick far surpassing the present establishment.

While upon this subject I cannot too strongly call to your notice the propriety of placing the whole jurisdiction of the river under the control of a public body; and it appears to me the Ballast-office in Dublin are the proper and natural guardians of the navigation of all rivers and ports of Ireland: and when carrying this into effect, I should at the same time recommend, that all the dues and taxes at present levied upon the shipping, either by the Corporation or any other body, should, if possible, be abrogated. I would further suggest, that the present quays and wharfs adjoining the river should be purchased from the owners at a fair valuation, and a new and equitable scale of taxes imposed, and paid into the Ballast-office by a collector, who ought to be appointed by the Government; and I have no doubt the returns would not fall far short of paying the interest of the money laid out.

The Wellesley Bridge and Docks should be taken into the hands of Government, and the quays extended so as to include the Custom-house; and lastly, I should suggest that a conservator of the river should be appointed, who would also act as harbour-master, and take care of the navigation, and all public works that may be constructed between the mouth of the Shannon to Thomond Bridge. Indeed I should advise, if the suggestions I have made with respect to placing the river under the control of the Ballast-office should not be thought advisable, still that an officer of this description should be appointed, to take care of all public works, and to make the collections that may be imposed in the event of any new work being undertaken in the shape of piers, &c.; for, unless there are some funds provided for the repairs of such works, they will in a few years be a heap of ruins, as we see from example of those built on different parts of the coast of Ireland by the Board of Fisheries.

The following is an abstract of the dangers I have proposed to be removed in the foregoing pages, and to have buoys and beacons placed on them:—

Kilriesk Beg, a mile below Limerick, requires the bar across the river to be removed.

The Pool requires eight or ten mooring buoys to be laid down for the accommodation of vessels. At present they use their own anchors, and three vessels have been seriously damaged by them this month; two of them grounded upon their anchors at low water, and were obliged to be hove down and repaired.

Two buoys are required a little below the Pool, to mark the channel.

One buoy off the spit below Kilriesk Beg.

One buoy off Cunoh Point, in the place of that now down, it being too small.

One buoy opposite to the above one off Cunoh Point.

The Cock Rock should be removed, or as much of the rough part taken away as would make it smooth and even, and the channel widened by taking off some of the tail; indeed all, if possible.

If any part of the Cock Rock is left it should have a buoy placed on it.

One buoy opposite to the Cock Rock on the mud extreme off Cunoh Point.

Six mooring buoys to be laid down in Lady's Hole, and one on the extreme edge of the mud.

The Ballast, a rough patch of stones near the Lady's Hole, to be removed and a buoy placed there.

Two buoys on the spit off Muckinish Point.

One buoy near the Harrold Rock, on the edge of the mud.

The Harrold Rock should be removed.

One buoy opposite to the Harrold, on the south side.

The sunken rock off Cratloe should be buoyed, if it is found too difficult to remove it, or likely to be attended with much expense, and a buoy placed opposite to it, on the south side.

The stones on the bank abreast of the sunken rock off Cratloe should be removed.

The Kippen Rock should be taken away, and a buoy placed on the extreme edge of the mud.

One buoy opposite to this, on the mud on the south side.

A cluster of rocks and stones, a quarter of a mile northward of the Kippen, should be removed.

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The Whelps, seven rocks lying on a sand bank, should be blasted and entirely removed.

Four buoys on the Whelps Bank, viz. one on each extremity, and one on each side.

A patch of rocks opposite the centre of the Whelps should be removed.

The Crawford Rock, very dangerous, should be removed.

Shawn-a-Garra should be removed; it is a very dangerous rock, almost always under water, and in the meantime a buoy should be placed there.

The Scarlets should be cleared as much as possible of the rocks and stones, and the sand near the tail dredged out.

Three buoys should be placed on this, the Scarlets; one on the north side opposite Greg Island, a second on the south side opposite Newton Point, and a third on the west end.

Greg Island has some stones on the point of it that should be removed.

One buoy on the spit of the island.

The Slate Rock lies near to Greg Island, and should be taken away.

The Hogshead Rock should be removed.

One buoy on the mud extending off from Bush Island.

One buoy placed on the edge of the mud in the bight opposite the Hogshead Rock.

A patch of stones should be taken off this mud, near where the buoy is recommended to be placed.

Battle Island mud flat should be cleared of some stones on the spit on the east side opposite the Hogshead.

Laheen's Rock, if possible, should be entirely removed, and a buoy placed on the edge of the flat which extends to it from Battle Island.

Some stones on the mud at the entrance of the River Maig, on the west side, should be removed.

Six or eight mooring buoys should be laid down off Grass Island, as it is the anchorage for large vessels bound to Limerick and not wishing to lie aground.

The Big Bird should be removed, and so as to open the North Channel.

Nine buoys would be required in the North Channel, if none of the rocks are removed from the middle ground; placed as follows:

One buoy on the north side of Sod Island;
One buoy on the extreme of Saints' Island, opposite to Sod Island;
One buoy off the point of Tradee;
One buoy on the point of Great Limerick;
One buoy on the tail of the Sand Rock;
One buoy off the Bridge Rock;
One buoy off the Little Limerick;
One buoy off Durnish Island;
One buoy on the tail of Carrickoclouch Rock, on the end of the middle ground.

There are four rocks on the middle ground named above that should be removed; viz. the Sand Rock, the Bridge Rock, Small Limerick and Carriekoelouch Rock; in which case some of the buoys could be omitted.

The South Bridges should be cleared of the loose stones, and the rocks removed if possible. Upon the manner this is done will depend the number of buoys that will be requisite.

Three buoys are at present necessary to mark the limits of the Bridges.

The Small Rock should be taken up, but until that is done a buoy should be placed there.

Three buoys are required in the South Channel, as follows:

One buoy near Gullivan's Rock;
One buoy near the Bridge Rock, on the middle ground, on the south side;
One buoy on the extreme spit of the middle ground, in two fathoms at low water.

Gullivan's Rock, opposite Sod Island, should be removed.

The Beeves Tower should be fitted up as a lighthouse.

The Herring Rock should have a buoy placed outside of it.

Carrigfoda Rock should have a buoy placed off it.

The Bowline Rock should have a beacon on the centre: a solid stone pillar would be the best thing.

Rinana

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Rinana Shoal, off Scattery, should have two buoys, one at each extremity.

Carigue Shoal should have a buoy off it.

One buoy is required off the shoal that extends from the north side of Scattery.

The Bale Bar requires a buoy to be securely moored.

The accompanying Chart of the Shannon, by Mr. Brown, will be requisite to elucidate the foregoing Report.

I have the honour to be, Sir,
Your most obedient and very humble Servant,
W. Mudge.

Col. Burgoyne, &c. &c.

— No. 5. —

REPORT of Captain *Mudge*, on the want of Piers and Wharfs at Tarbert, Kilrush and Carrigaholt.

No. 5.
Report of Capt. Mudge, on the state of Tarbert, Kilrush and Carrigaholt.

Sir, Limerick, 20th December 1831.

IN compliance with my instructions, I have been to Tarbert, Kilrush and Kilballyhone, in the bay of Carrigaholt, all of which places were represented as being in much want of piers or landing wharfs; and I here subjoin a Report of the same.

Tarbert.

Tarbert is situated on the left bank of the Lower Shannon, about 30 miles below Limerick, and the bay is formed by a deep bight, terminated by a small stream running past the town. The north side of the bay is made by the island of Tarbert, which is only insulated at high water; a small and dilapidated causeway, about two feet above the sand, serves to admit foot passengers to pass to and fro at half tide. This roadstead is good and secure, and has sufficient depth of water to accommodate vessels of the largest class. A bank of sand and mud, that dries at low water, extends from the bottom of the bay to nearly a mile out from the creek joining Ballydonher Point on the one side, and curving inwards, unites to Tarbert Island on the other. Within a quarter of a mile of this bank vessels lie in from four to six fathoms at low water, but the bank is very abrupt, and deepens suddenly to 12 fathoms; and in consequence of this, with the wind off shore, that is, from the west and south west, vessels are frequently driven with their anchors off the bank, and are then obliged to run up the river for Labasheeda Bay: however, from all I can learn, I apprehend that these are cases to be attributed in a great measure to having light anchors and an insufficiency of cable out, for in a land-locked road of this description merchant shipping are very apt to depend more on a short scope of cable than prudence would warrant. Upon the whole, I consider the bay of Tarbert to be a good and secure anchorage, and with proper arrangement, and if moored, capable of containing 150 sail.

There is a lighthouse building on the extreme point of the island, which will be found of great use; it will enable shipping to run for this anchorage at night, when they are driven from Carrigaholt or Scattery. In this point of view, Tarbert may be considered as an asylum harbour, and such it will prove to be.

Tarbert has a small and neat town, consisting of about 200 houses; it does not appear to possess any foreign trade, but is indebted to its localities for its improving condition. It has not only a good harbour, but it lies on the high road to Killarney, and is now becoming the focus of a very extensive exportation of grain, and indeed of all the produce of the surrounding country, which consists of corn, cattle, butter and pigs. I find upon inquiry that the exports this year have been very considerable, but owing to the want of proper quays or wharfs the difficulties encountered have tended very much to check the shipment of some of the articles, especially pigs; for it appears the boats cannot start from the creek where they take in their cargo till nearly high water, and if they are baffled in this the boats are obliged to lie aground till next tide, and possibly, if late in the evening when this accident takes place,

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they must remain 10 or 12 hours before they can start for Limerick. It mostly occurs during such detention a great number of pigs are smothered; and very often the corn becomes damaged by heavy rain, or the spray beating over the boat while on the mud.

This is a serious complaint and not without foundation, for several accidents of the kind have happened lately. It would be very desirable to have the means of boats loading at a pier, which should be so situated that there could be free communication at all times of tide; and I am of opinion that such a pier might be easily and cheaply constructed on the south-east side of Tarbert, where the water is deep near the shore: about 250 feet, run out from low-water mark towards Shannon Lodge, would give three fathoms alongside the pier head; this would enable the steam boats that are now plying on the Lower Shannon to go alongside, so that the passengers could walk on shore, and the cattle could be shipped in a few minutes, thus saving a considerable portion of time which is now consumed when any number of cattle are to be taken on board; besides which loss of time, the animals are often much deteriorated for the markets, by being bruised and sometimes maimed. The passengers are also considerably inconvenienced, and often endangered in rough weather. Taking all these circumstances into consideration, and more particularly the improving condition of Tarbert, arising from its great exports, and all the roads in the vicinity being, as I understand, sufficient and good; also the facility afforded of procuring stone cheap, and the site for such a work being very favourable; I certainly think I may safely recommend to your notice this place as requiring a pier: and I believe sufficient tolls might be imposed to form a separate fund for keeping it in repair; though I am persuaded the country people would not willingly pay a tax equivalent to the interest of the money laid out; sooner than do so, they would risk the shipment of their cattle in the present manner. Should any tax be levied more than for the purpose of repairs, I think that upon passengers, their servants, carriages, &c. would be the only one at all productive. I endeavoured to obtain some authentic information as to the exports of Tarbert, but there does not appear to be any account kept of the articles shipped, and all I could learn on this head was from some of the boat-owners and agents; their statements were verbal, but I am induced to believe generally correct.

Proposed Pier.

Amount of Shipments.

I am told the shipment of pigs during the year will average from 450 to 600 per week, for three months of the year; butter, 200 firkins for three months in the year; of cattle I could not obtain satisfactory information. Grain appears very considerable, but mostly shipped in bulk; but the country people come down with this in their sacks, and often go up to market with it themselves, paying only the freightage.

I have said I should recommend the pier to be built on the south-east end of Tarbert, and my reasons are these: it must, in the first place, be least expensive, as it would be of less extent; and in the second place, the water is deep within 150 feet of low-water mark; and thirdly, it will afford better protection to boats, &c. from the easterly gales, which in some seasons blow many weeks together; and the short sea setting down the river would render any other part of the bay more objectionable, as you could not have protection without extensive works.

It would be necessary to form a short piece of road to connect the island with the main at high water; the extent would be about two hundred yards; and making a road something less than a quarter of a mile from thence to the proposed quay.

The present road leading into the town is an exceedingly good one, and I believe it has been made at the expense of the Steam Navigation Company.

Kilrush.

THE harbour of Kilrush lies on the Shannon, seven miles below Tarbert; it is a dry harbour, and has a bar of sand and rocks extending across the mouth of it, which in my opinion is sufficient to preclude the possibility of making the harbour navigable even at half tide. If the bar were cleared away, I think, the mouth being open to the south-west, the southerly gale would continually fill it up, and the expense of dredging up the sand and shingle so thrown in would be very considerable. But this is not all that the harbour would require to make it useful, for it should be deepened several feet, so as to secure five or six feet

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feet of water more than a vessel would draw, to go over the bar at high water in blowing weather; at present, with a south-west gale it is entirely exposed, and from the shallowness of the entrance, the sea would preclude any vessel getting either in or out. There is a custom-house and some storehouses situated on the north side of the harbour, but I am not aware if they are of any service. This place is frequented by a few vessels from 100 to 120 tons, which ship off cargoes of grain to various parts of England, but owing to the shallowness of the harbour they are generally detained a considerable time, if they allow the spring tides to pass without taking advantage of them to go out. I do not think from what I have seen that any capital could be expended on this harbour likely to be of general utility; all that can be done for this place may be easily accomplished by the proprietors, who derive immediate benefit from the trade and have an interest in the harbour.

There is a pier extending from the shore at Kilrush towards Hog Island, a part of which was built by the Board of Customs, but it did not extend farther than low-water mark. The Board of Fisheries have added 168 feet to it, which cost the sum of 1,800 *l.*, but it is a substantial and well-executed work: this has been carried into four feet at low water, and therefore will only admit of a vessel lying alongside at high water. This is a very considerable inconvenience, as it is necessary to start from the quay at low water to carry the flood tide up to Limerick, consequently a whole tide is lost; for a vessel would have to haul off at high water when she is laden, and remain the six hours tide, that is, till low water, before she could start for Limerick. The grain from this part, as well as cattle, pigs, &c. are mostly taken up to the city in country boats, which average from 40 to 50 tons: these vessels generally load in the harbour, but of course are often prevented getting out by southerly winds, when they might start from the pier with a sure prospect of a quick passage to the quays.

Detention proves very injurious to the country farmers, who bring down their pigs and grain, and ship them often without considering the state of the tide; or if they do calculate to provide for this, of course they are quite at the mercy of the winds, and it often happens their pigs die either from suffocation or bruises, their corn is soddened by salt water, and their little earnings are thus totally lost. The extension of this pier would afford the means of the farmer having a more cheerful prospect of seeing his commodities get a speedy and safe conveyance to the markets; and since the establishment of the steam packet which now runs between Kilrush and Limerick, the extension of this pier becomes a matter of actual necessity, for at present all the cargo is obliged to be shipped by means of a boat, as the vessel cannot lie alongside for want of water; this not only occasions great delay, but in blowing weather the exposure to the sea which runs between Hog Island and the pier causes many serious accidents: during the time I was at Kilrush I witnessed a casualty of this kind; one of the boats heavily laden shipped a sea and went to the bottom. The passengers, who form no inconsiderable number, have to experience very hazardous landing; and with all the precautions the master of the steam vessels may take, it will be next to an impossibility to secure the lives of people passing to and fro, for every one is impatient to get either on shore or on board, and the boat becomes very often dangerously crowded.

Steam Navigation.

The utility the steam vessel has been to the public since her arrival on this station, would warrant a considerable expenditure to secure the extension of this description of vessel plying on the Shannon; but without the protection of a good and substantial pier the steam vessels cannot continue to run during the winter season, and it appears to me their greatest run of trade will be in the winter months, when all the country are sending their grain, butter and pigs to Limerick; and of course at this time of the year a quick and sure passage is of the utmost importance, and that can only be insured by means of a steam vessel. On these grounds I recommend that the present pier be extended about 200 yards farther out, in the same direction towards Hog Island, so as to cross and include the channel of 2½ fathoms at low water, which would give accommodation not only to the steam vessels, but to all those vessels, &c. which at present take in their cargoes within the harbour.

A Pier recommended.

Shipments.

The yearly exports of grain, cattle, butter and pigs are very considerable, and certainly more than double any other place on the Shannon, but there are no accounts kept of them, therefore it was only by close inquiry I could gain any

Slate Quarries.

any information as to the amount; but from the size of the town of Kilrush, which is supposed to contain 10,000 inhabitants, there must of course be considerable trade, demand as well as export. I believe a toll might be established that would keep the works in repair, and possibly make some return, though certainly not sufficient to cover the interest of the money laid out. I would beg to suggest, that if any works should be undertaken, it shall be inquired whether or not the *slate flags* at the quarries of Morrey, of the silicious kind, may not be advantageously used; for their dimensions are very large, and varying from six to eleven inches in thickness, and of any superfices that may be required. I am induced to make this observation from observing that the present quay of Kilrush is built of limestone, which was brought from a distance of 20 miles, when the slate quarries are within less than three miles of the town, and can be worked at one-fourth of the expense.

Carrigaholt. See Plan 2.

Exposed to violent sea.

Carrigaholt, in the parish of Kilballyhone, or Kilballyowen, lies at the entrance of the Shannon, in the county Clare. It has been proposed to construct an asylum harbour in the outer bay, by forming a breakwater or pier from Kilkadrane Point, so as to break off the sea and swell which sets into the bay with a south-west or southerly wind. The water is deep off the point of Kilkadrane; and by looking at the plan by Mr. Cowan, it will be seen there are five fathoms water a quarter of a mile from the shore, and seven or eight fathoms not far outside of it, so that any work that could be carried out must commence in deep water. I must here observe that this part of the Shannon is exposed to the whole ocean swell, and the sea which sets in with a continuance of westerly or southerly winds baffles all description, and epecially when accompanied by the "rollers," a periodical visitation; at such times the swell will break in 12 and 13 fathoms water, or wherever there may happen to be any foul ground.

From this circumstance I am sure it would be very difficult to construct any work that could resist the effect of such a sea as this place is continually exposed to, and I am confident it would at least require a very large sum to make any effectual barrier during heavy gales; indeed, let any man come to this place during one of those frightful gales that rage during the autumn, where he will witness the whole ocean rolling sea after sea, unobstructed for more than 2,000 miles; then he may form some opinion of the practicability, I may say possibility, of constructing an asylum harbour at Carrigaholt, of sufficient extent to protect the description of vessel it would be required to shelter. I do not mean to say the scheme is utterly impossible, but I am sure the expense of such a work would be beyond all calculation, and the trade of Limerick does not warrant an undertaking of so much magnitude.

Proposed Improvements of the Inner Bay.

The inner bay of Carrigaholt is more protected from the south winds as well as the westerly; but it is shallow, not having more than 2 ½ or three fathoms within the line from Carrigaholt Castle to the opposite side of the bay. It has a village close to the shore, a stream runs past the foot of it into the bay: here is a small pier which has been constructed at two different periods; the first part was made by the Board of Fisheries, and afterwards added to by a presentment of the grand jury. This little work has been of considerable service to the farmers, as it enabled them to ship a great deal of grain direct to Limerick; but owing to the pier not being extended sufficiently out, the tide leaves it at the last quarter ebb, and the sand dries for at least 100 fathoms outside of it. This precludes the boats from leaving the quay at the proper time of tide, for they cannot take in their cargo so as to start from the pier till after half flood, as there will not be water to float their boats till after that time; consequently, if the wind is from the eastward of north, they will not have sufficient flood to carry them up to Scattery or Kilrush before the ebb tide makes, and in this case they are obliged to return back to their port; this very frequently happens to them, and in consequence their corn gets damaged by the salt water, and their pigs very often are smothered; indeed, it appears they have almost given up sending swine by these boats, owing to the great losses they have so often experienced.

The subjoined documents will show that this place is worthy the protection of the Government, both as to the importance of the trade of the surrounding country,

country, and the excellent and peaceable conduct of the farmers and the people generally of Carrigaholt; for during the late disturbances in the county Clare, this place remained peaceable and tranquil in the midst of tumult and murder.

Proposed Pier.

I beg to suggest that a small pier should be run out from a spot called Lord Clare's Pier, at nearly a right angle to the shore, and be extended sufficiently to afford shelter to the one that is now near the village, and this also should be lengthened so as to permit the boats to sail from it at nearly low water. The expense attending this work ought not to be very considerable, for there are very fine slate quarries within two miles of the spot, and labour here is very cheap.

Shipments.

I have taken every means of procuring correct returns of the exports and tonnage of the vessels employed in the corn trade, and by the accompanying documents it will appear that three individuals ship on their own account annually 900 tons of grain; about 700 firkins of butter, and as many as 3,000 pigs, were sold at the different markets in the neighbourhood; but lately the people have given up sending pigs by the boats, owing to the great losses they have sustained by their being smothered in the boats when detained, as I have previously described. The exports of hides amounted in this last year to 221. The returns, I am informed, have not been made to the full extent, but are given considerably under the true amount, owing to the fear the small farmers have of their landlords' rising their rents if they should hear of their prosperity.

Carrigaholt appears to be the principal place for the shipment of grain and the produce of the surrounding country, and I have no doubt, if the shipment of their commodities be rendered more safe and easy, it will become a place of some importance, though at present a neglected and almost isolated village.

Bad state of the Roads.

The roads in the vicinity are rather scarce, but there is one good road constructed by Mr. Killaly, commencing near Kilrush and extending within a quarter of a mile of Carrigaholt, where it suddenly terminates, leaving the approach to the village one of the vilest I have ever seen; indeed, it is almost impassable for a horse and car, and I believe the general plan of the farmers is to take their cars over this part empty, and return with the horse to carry the grain, &c. in sacks upon the animals' backs, either to or from the boats. A very small sum would accomplish the repairs of this piece of road.

A small toll should be imposed to keep any work that may be undertaken in a state of repair; and I think it would be cheerfully paid by the major part, when they see it devoted for their own benefit and comfort.

The accompanying sketch is merely to illustrate the positions, &c. from whence the piers should be projected. See Plan 2.

I have the honour to be, Sir,
Your most obedient and humble servant,
Col. Burgoyne, &c. &c. *W. Mudge.*

—No. 6.—

EXTRACT from Capt. *Mudge*'s Letter, dated 2d January 1832.

No. 6.
Proposed Improvements in Foyns' Island.

Upon the subject of the Lower Shannon, I think the neighbourhood of Grass Island capable of being made a very good port; but looking at the question in all its bearings, I should be more inclined to suggest to your notice the Island and vicinity of Foyns, a little below the Beeves: at present it is merely a place where the quarries of limestone are worked, and seldom visited or resorted to; it lies on the south side of the track of vessels going up or down. I think that place affords great advantages for constructing both docks and quays, and moreover has a secure anchorage for any number of shipping. On the south-east side of Foyns would be the most eligible, and the quarries are close at hand, for in fact the whole island is in one mass of limestone; at present it is of no service as a roadstead, and vessels never go there but as a mere casual thing.

No. 6.
Proposed Improvements in Foyns' Island.

Why I prefer Foyns is from its lying in dead water and having wide navigation to the very anchorage, and would admit an unlimited number of vessels of all descriptions. Grass Island would be more confined, and on that account perhaps not so eligible. I send you a tracing of Foyns, which you will find to correspond with Cowan's chart of the Lower Shannon, which I returned to you a few days since.

Limerick,
2d January 1832.
(signed) *W. Mudge.*

— No. 7. —

No. 7.
Report of Capt Mudge, on the Navigation of the Fergus.

REPORT of Captain *Mudge*, on the Navigation of the River *Fergus*.

Sir, Limerick, February 4, 1832.

See Plans 3 & 4.

I have the honour to subjoin a detailed Report upon the navigation of the River Fergus, from Ennis to the entrance; and as there does not appear to be any direction given in any book or charts for sailing into this river, I have endeavoured to supply that deficiency, as well as circumstances would permit me to do, without making an actual survey. To describe the pilotage of this river, it is necessary to commence at the mouth; from thence, to proceed up to Ennis.

Navigation of the Fergus described.

The entrance to the Fergus lies between Rinana Point on the east, and Innis Murry on the west; is about five miles in width, but the ship channel is confined to narrow limits, being not more than three quarters of a mile wide.

A cluster of islands lie on the larboard hand, some of them being a mile in length and half a mile broad; they extend over a space of about four square miles, and are surrounded by extensive mud banks, having sounds or channels between them, but I believe only navigable for boats. At the extremity of the mud flats, bordering the ship channel, there are several rocks on both sides that uncover at low water; of these I shall give a detailed account as I proceed. The starboard side of the entrance is bounded by mud banks that uncover at the last quarter ebb, and several islands that lie four or five miles up the river are also girded by mud flats.

A ship bound for Clare, which is the present limit of the navigation, ought not to draw more than 16 feet water. The town is about 12 miles from the entrance, and a vessel going there, having arrived abreast of the Beeves Tower should steer about E. by N. till the Beeves Tower appears to be on with the northern house on Ackinish Point; you may then regulate your course so as to keep these two marks in the same line, you will steer about N. 57° E. This course will clear you to the southward of the small rock, or more properly the Carrigtrawara Rock, in eight fathoms water. This rock lies from the Beeves N. 50° E. one mile, and from the south low island near Thyme, N. 41° W. half a mile. It is a low, flat, rugged rock of limestone, and shows at last quarter ebb; it lies in a N. E. and S. W. direction, is about 30 fathoms long and 20 broad; there are seven and eight fathoms close to it. It is absolutely necessary this rock should have a buoy placed near it; at present there is not one buoy or beacon in the whole river. A quarter of a mile N. W. of this rock there is another one, it lies near the mud; between these two dangers there are four and five fathoms.

Continuing to steer with the Beeves Tower on Ackinish House, you will see Brown's Castle, which is situated on the county Limerick side, about a mile and a half in shore from Ballinbochag Point: the high and slender tower of the castle bearing about S. by E., you will observe a house on the low shore beneath it, in the same line with the castle; this is the mark for altering your course to steer up the Fergus, and will carry you clear of the dangers on both sides, and take you to the first anchorage, which lies under the first low island, called Thyme. On the above course, which is nearly N. E., you will pass, first, on the larboard hand, the small rock, or Carrigtrawara Rock, off which you will have eight fathoms. The Horse Rock lies N. ¼ E. half a mile of the small rock, on the edge of the mud flat off Thyme; it is a large patch of limestone, from 50 to 60 fathoms long, and dries at half ebb. This rock

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rock requires to be buoyed, for the tide sets down on it, and in light winds it is difficult to keep a vessel clear, as its position is not sufficiently defined by the rippling of the water. On the starboard hand, by the course described, we avoid the Moylan's Children, two rocks that show at last quarter ebb: they, like all the rocks in this river, are of limestone; there are six and seven fathoms close to them. These rocks also require a buoy; they lie abreast of the Horse, and only one-third of a mile from it. Moylan's Rock is on the mud bank off Rinana Point, which dries at last quarter ebb, three-quarters of a mile off, towards Moylan's Children.

The mud banks are steep on both sides, but are very soft and deep, so that a vessel would lie on them without creaning.

I have said that the slender tower of Brown's Castle on with the house at Ballystone about S. by E., will take you to the first anchorage; the marks for which are the tower of the Beeves on with the centre of Thyme bearing S. E., distant one-third of a mile, and Inchannacume Castle on with the north end of Low Island, in six fathoms mud and good holding ground: here, with proper ground tackle, you may lie in perfect security, and with a light on the Beeves it would be an anchorage available at any hour of the night. To navigate the channel up to Clare, you continue the same course till abreast of Brakanish Rock, where the channel shoals to four fathoms; the truest marks for this rock are the Beeves Tower on with Thyme, and the north house on the island of Flanagaranoch on with the north end of Low Island. You must steer then for the peak of Coney Island, about N. N. E., until the east end of Coney or Inishtagram Island, and the West Ing, which lies north-west of Coney about three miles, are in the same line: you will carry 4½ fathoms, then alter your course for them, keeping these marks on, steering about N. E. by N. You will have passed the Brackanish Rock on the starboard mud bank: this rock requires a buoy to be placed on it; it is of limestone, and about six feet above the surface of the mud, and of considerable extent; it dries at last quarter ebb. The channel is formed by soft mud banks, which are of great extent.

You continue to steer with the extremes of the two islands, as before described, in the same line, and you will gradually shoal from five to four and 3½ fathoms, which latter soundings appear to be on a mud spit, extending from off Brackanish Rock towards Coney, and crossing the channel obliquely, forms a bar. It then deepens to four and five fathoms, when you will have arrived within half a mile of Coney Island, under which, and about a quarter of a mile from it, abreast of an old church, you will find good and secure anchorage; the ruins bearing about N. N. W. quarter of a mile, in six fathoms water. But before you arrive quite to these roads, you will observe an island on your starboard hand, having a remarkable perpendicular cliff on the north end, called Dynish Island Cliff, to be in the same line with the eastern round hill of two, called Killconary or Clanca, and bearing about N. E. by E.

This course will take you between the Rood Rock on your larboard hand, and the Priest's Rock on your starboard hand. These rocks are separated about one-third of a mile. The former lies in deep water, and there is a passage on both sides of it, having five and six fathoms water; but it is better to leave it to the northward, and follow the channel as I have described.

It is a mass of solid limestone, and begins to uncover at the first quarter ebb. This rock should have a beacon built upon it, and it might be formed of the rough stone. The channel here is half a mile broad.

The Priest Rock lies on the edge of the mud bank off Finish Island, on the east side the channel; it shows at the first fall of the tide, and lies nearly in an east and west direction. It is a rugged and straggling rock, about 100 fathoms long by 30 broad. This danger should also have a buoy, or rather a beacon, on it; and if this and the one on the Roadway be judiciously placed, they may be made to answer as leading marks to avoid the Brackanish to the west side, and a fair way-mark for vessels sailing up the river to clear the Horse Rock and Moylan's Children. This would simplify the navigation of this part of the channel considerably.

The mud banks on the west side of the channel should have three buoys laid down on the edge: one at the first anchorage under Low Island and Thyme; a second at the swashway halfway to Coney Island; and a third on the mud abreast of the second anchorage, under the ruined church of Coney. There should also be one buoy between Moylan's Children and Brackanish Rock, and

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a second buoy between Brackanish and the Priest Rock. These would, with the buoys on the rocks, define the channel so well that the present leading marks would not be necessary, and the navigation would be very much facilitated, as in general the atmosphere in the vicinity of the river is so hazy that the marks are seldom discernible.

Passing between the Roadway Rock and the Priest Rock, you will find five fathoms and six fathoms as you approach Dynish Island. Having arrived abreast of these rocks, you will observe the low rocky point of Finish Island stretching out towards the former, contracting the channel between it and the Roadway Rock to about two cables length. This point dries at low water springs a considerable distance, showing a rocky and rugged shore; but this danger will be avoided by keeping the before-mentioned marks in the same line, viz. Dynish Cliff, on the southern hill of Killconary, called Clancy or Clanca Hill, until you bring the trees near some houses on the island of Finish on with St. Patrick's Hill, a remarkable and distant mountain in the county Limerick; then alter your course, keeping these marks on, and you will avoid the Muscle-bed Bank on your larboard hand; this shoal lies close to Rat Island, and is in fact connected with it. In this part of the channel you will have four fathoms; there are several large stones lying on the Muscle Bank. Rat Island is an extensive ridge of rock, situated off the east point of Coney Island; a part of it is always uncovered. Between this and the point of Coney Island there is a sound, through which vessels drawing from 10 to 11 feet often pass, with a leading wind. This channel is narrow, and has not more than two fathoms in it at low water. The point of Coney as well as Rat Island are composed of limestone, the strata of which lies in the same direction, and stretch out towards each other. I went through this channel at high water, with a leading wind, and considered it quite safe.

The tide passing through this narrow gap causes a kind of race, which is rather favourable than otherwise, though somewhat alarming in its appearance. Under Dynish Island Cliff there is good anchorage in from four to six fathoms; a considerable fleet of vessels might stop there. But following the ship-channel up to Clare, you steer keeping the before-mentioned marks on, viz. St. Patrick's Hill on the trees in the centre of Finish Island, until you open Clenca House to the northward of Buirinaha Point; you will then be drawing close to the mud banks on the starboard side, and in about 2½ fathoms at low water. You must now alter your course, and steer for the Bolan Rock, which you will see about N. by W. of you, a mile and a quarter distant; but in case this rock should be covered, steer about N. by W., and you will find the water gradually shoal from 2½ to 1½ fathoms, soft muddy bottom. Here I should advise a pilot being taken, as the navigation becomes contracted, and for the want of buoys and beacons, also intricate; but wishing to anchor above the Bolan Rock, you may continue the same course until M'Donald's House, which will be seen to the northward about four miles, is nearly in one with the east side of Vaunan Island, bearing about N.N.E. ½ E.; this is the leading mark to pass clear of the Bolan to the southward and eastward. When you are abreast of this rock, which you may generally know from the tide rippling over it, you will see the temple of Drumoland on with the south side of West Ing; a quarter of a mile above this you may anchor in nine feet at low water, soft mud. The Bolan Rock uncovers at first quarter ebb; the upper part consists of large blocks of limestone, which might be easily removed, but under these the rock is a solid mass: it lies on the west side of the channel, on the edge of the mud. It is about 50 fathoms long, lying nearly east and west; a buoy should be placed on it, and one also on the opposite side. Off the mud flat, close to the rock, there are 11 feet at low water. Perhaps a beacon would be the most eligible way of showing the position of the Bolan, and the least expensive. From hence the channel is narrow and sinuous, all the way to Clare. I could not obtain marks to carry a vessel higher up, therefore it becomes absolutely necessary to take a pilot; though if the channel were properly buoyed, &c. there would be no reason to prevent any one taking their vessel, after a trip or two, up to the quay of Clare.

The banks on both sides are of soft mud, from 6 to 10 feet deep, so that a *sharp vessel* would sit upright, though the water should leave her. Having passed the Bolan Rock you meet only two difficulties before you get to the quay of Clare. The first, after passing the Bolan, is off Craw Island; this consists

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consists of a ridge of limestone that projects off from the island, and extending nearly across the channel, and over which there are not more than a *few inches* at low water; these rocks could be easily removed, and I believe without the assistance of a diving-bell. I should think a good lighter, provided with suitable gear, might weigh the whole of these stones during a few low tides in the summer. The banks on both sides are of soft mud, and are six or seven feet above low-water mark. Craw Island is about two miles above the Bolan, and at the channel at low water is about a cable's length broad, and has from six to seven feet in it. The tide here seldom runs at a rate exceeding 2½ miles per hour, even with the freshes in the winter, and of course not so strong in the summer.

The sluggishness of the tide is the cause in all probability of the great difference between the Shannon and the Fergus. The tide runs with so much velocity in the former that the bottom of the river is almost scoured of the mud, it being generally but a few inches deep in the centre of the channel; while the feebleness of the tide in the Fergus permits the mud to accumulate.

Having passed Craw Island and the bar which runs from it across the channel, you will see the entrance to the Asullas River, a small creek, which is frequented by turf-boats, it is nearly dry at low water: from hence to Clare we meet but one obstruction, and that is in the bight of the reach called Carnelly; here there are several sunken rocks or stones, lying nearly across the river, and at low water contract the channel to a few feet, but the whole of them might be removed without any difficulty. The banks on both sides are composed of very deep and soft mud, and are 10 or 12 feet above low water, and a vessel of any build would lie on them without creaning; on this account, and the channel being so very narrow, and generally lying midway from both shores, I do not think it would be necessary to have any buoys higher up than Stanmegara Point, opposite to the creek of Asullas. From Asullas to Carnelly there are from five to six feet water; above that to the Pool, where the river is about 300 feet broad at low water, a little below Clare, there are about four feet, though in the Pool itself there are six feet water. A few mooring buoys laid down in this part would be of great service to admit of vessels lying by them, instead of using their anchors, and obstructing the navigation by cables and warps across the river. From the Pool to Clare, which is about a furlong distant, the water is very shallow, there not being more than two or three feet at low springs, and the bottom of the river here is scoured by the freshes, leaving a rocky bar quite bare, which runs across the channel, and at low water is visible; but on both sides, the banks from low to high-water mark are of soft mud.

Pier at Clare.

At Clare there is a kind of quay constructed in the year 1815 or 1816, out of some funds remaining from the subscription raised in England for the distressed Irish of the western districts; but the sum so appropriated only amounted to 120 *l.*, and of course could make but a very small pier, though it has been of considerable service, for before this accommodation there were no means whatever of discharging a cargo, and I am informed that it was very seldom vessels of any description went to Clare; they have now, I am informed, one or two vessels every month, bringing coals and taking grain away to Liverpool, where it has sold this last year at 7 *d.* per stone of 14 lbs., higher than any other grain in the market.

There might be many little improvements made in the upper part of the river from the quays to the Pool, without incurring any expense; indeed it is curious that the people who frequent this port do not make their crews during idle hours clear away some of the loose stones and rubbish that at present lie opposite the pier, and on which one or two vessels have received injury; in fact, as matters now are, every vessel is liable to the same accident.

Tides.

The quay is about 80 feet long, and will not therefore admit more than one vessel at a time, and a boat at each angle. It is 14 feet 6 inches above the bed of the river, and the top of it is considered to be equal to the rise of a high spring tide, but that an extraordinary, or rather an unusual tide, will rise 12 inches higher. In my opinion this is much exaggerated, for on the 3d of January 1832, the highest of the springs, after a very heavy fall of rain, the tide did not rise within three feet six inches of the top of the quay, giving barely 11 feet alongside the quay; so that a vessel at this time taking in a cargo of grain was obliged to leave off shipping more, for fear of not being able

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able to float off. In summer there will not be more than nine or ten feet alongside the quay during the springs, and not more than six or eight feet at the neaps. The perpendicular rise and fall of the water is said to be 14 feet at the springs; but I am sure from my table, taken from actual observation, that 12 feet will, if anything, overrate the quantity, and 11 feet 6 inches will in general be the rise, though occasionally it may be exceeded by one or two feet: a 14-feet tide may take place at the equinoxes. The neap tides will rise and fall seven feet six inches, and sometimes nine feet, but the former may be taken as the average throughout the year. This is a very important feature in any attempt at improving this port by constructing docks or cutting a canal to unite the navigation of the Upper and Lower Fergus.

Every one interested in this question wishes to give the impression of a 14-feet rise and fall; this is a fallacy, assumed on unusual tides, to give apparent advantages to the port far greater than it really possesses, for a difference of one or two feet in a port of this description considerably alters its importance, and especially when applied to the question of constructing docks or cutting canals. I think it right to make these observations to prevent this piece of trickery being palmed off on the Government. I found the pilots particularly anxious to impress me with this belief, and with them I suppose it originated. A man whom I placed at the quay head to observe the rise and fall every 15 minutes through the day, attempted to deceive me by altering some of the heights to a quantity equal to two feet; but this I detected, not only from the incongruity of the observations, but by cross-questioning I got from him the marks to which the tide had risen on the side of the quay.

Limestone Rock opposite Clare.

Opposite to the quay there is a small island, or rather a rock; it is about 30 yards in circumference; it is of limestone, and might be removed with ease; it is at present surrounded with loose stones, but everything here appears to be neglected, and by far the greater portion of the produce of the surrounding country finds its way to Limerick, so that at present there are but one or two merchants or factors, at Ennis, that ship grain from Clare.

Bridge at Clare.

About 600 feet above the quay of Clare there is a bridge crossing the river, the butments of which are built on a solid bed of rock that forms an obstruction that separates the Upper from the Lower Fergus. This bridge joins to an island on which stands the castle of Clare: a second and a smaller bridge crosses the arm of the river that runs round the Castle Island, and unites with the mail-coach road to Limerick. The stream that passes round the castle continues to wind down a rocky and crooked channel, and falls into the Lower Fergus, near the Pool. The main branch of the river from the bridge to the quay is about 250 feet wide, and the bottom in general is of solid limestone. The inclination of the bottom between the fall and the quay is about nine inches in 100 feet, and the top of the rock on which the bridge stands has a fall of only two feet; the total fall being but six feet in 600 feet, the distance of the quay from the bridge.

Navigation for Small Vessels.

In the centre of the river, between the little rocky island and the quay, from which it is distant about 120 feet, there are three feet at low water; but the channel having this quantity of water is a mere vein. The general character of the navigation of the Fergus for small vessels is decidedly good, and in many particulars much superior to the Shannon from the Narrows to Limerick. The current of tide in the former is quite sufficient to assist a vessel to work up or down the river, but not of that strength to render her at any time unmanageable: the few dangers that border the channel might be buoyed or have beacons placed on them, for I do not think it necessary to remove any of them between Rat Island and the entrance; in all other parts the mud banks on each side are soft and deep, so that a vessel would not receive injury if she were to get on them.

Anchorages.

There are three very good anchorages in this river, which the Limerick Branch does not possess, viz.: at the entrance under Low Island and Thyme, in five and six fathoms; secondly, under Coney Island or Inishlagraam, in six fathoms; and thirdly, off Dynish Island Cliff, in from three to six fathoms: at either of these anchorages a ship might stop with safety. But for small vessels, drawing 14 feet water, there is good anchorage four miles further up above the Bolan Rock to the northward of West Ing, and indeed the bottom is of that soft nature that vessels not drawing more than 14 feet may lie in six feet water in any part of the river below the Pool, with the exception of the

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three dangers I have named, the Bolan Rock, the stones off Craw Island, and Carnally Falls; all these dangers might be removed with ease and for a very inconsiderable sum, and then the safety of this port and the superiority of the navigation over that part of the Shannon approaching Limerick, would be so apparent that I am sure Clare would soon have its due share of the commerce which is now almost solely engrossed by Limerick. But it would be necessary to have some better accommodation in the way of wharfs, which might be constructed with ease, and I should think cheaply, for the stone could be had on the spot; all the rubbish should be removed, and the rugged uneven bottom made smooth below the bridge. These improvements would be useful, and in fact necessary, for until then shipping will not generally frequent Clare, for the want of accommodation.

Jurisdiction. At present there is not any body or persons having jurisdiction over the waters of the Fergus, and therefore it remains unshackled by duties, taxes or tolls of any kind; the pilots are self-constituted, and of course are generally very bad.

Capability of Improvement. The Upper Fergus is a fine piece of water, and bears more the appearance of a large canal than of a river, for the stream a quarter of a mile above the upper part of the obstruction is but feeble. The least water in any part of it during summer is from 13 to 14 feet, though in most parts there are from 18 to 25 feet. The tide causes the river to swell with the flood several feet, and everybody supposes the tide flows up to Ennis, but this is not the case, it is merely an accumulation of back water, which sometimes, and when borne up by a very high spring, flows over the banks: if the salt water which runs up to Clare were also to continue its course to the Upper Fergus, the land inundated by it would become barren, instead of presenting, as it does now, a fertile and healthy appearance.

By the river, from Clare to Ennis is nearly three miles, and navigable within a quarter of a mile of the town; the width is about 150 feet, and the banks nearly parallel all the way, not sloping but almost perpendicular. Mr. Killaly has made a very accurate survey of this part of the river, by order of his Excellency the Lord Lieutenant, in the year 1831; this appears to be executed with so much care, and I found my soundings correspond so well, that I thought it unnecessary to proceed far with that part of the question.

It is necessary to mention, that I observed all the streams and drains which empty themselves into this part of the river, discharged a full and copious stream at high water neap tides, that is to say, when there was 12 feet water at the quay of Clare all the drains performed their office, showing that the surface of the water was much below the surrounding callows. This appears a circumstance that might be taken advantage of in any attempt to form a communication for shipping between the Upper and Lower Fergus, and would considerably lessen the expense of such an undertaking by damming up the water above the bridge, equal to a neap tide. This would always give eight feet over the falls or rapids, which extend from the bridge about a furlong up the river, where it is at present almost dry at low water; then construct at one side the dam a lock of sufficient dimensions to admit a steam vessel; at high water a vessel would float from the quays up to the gates, and pass into the lock and up the river.

But it would be necessary, previous to forming the dam and lock, to deepen the bed of the river along the present obstruction, to the deep water, by sinking it in some places from three to six feet, and removing an old mill dam that at present extends across the river. It would also be necessary to have a dam and sluice gate at the arm of the river that winds round to the southward of the old castle of Clare, to regulate the discharge.

From the quay to the bridge would also require to be deepened about four feet, to have the same water as at the quay. The accompanying sketch I intended to illustrate this subject; but I do not mean to advance this proposition farther than as having been overlooked among other projects, and whether it would not be the cheapest plan, as well as the most practicable mode, of continuing the navigation to Ennis.

Proposed Improvements. I am aware there have been many plans proposed to unite the navigation of the Upper with the Lower Fergus, and I dare say some of them cannot well be surpassed in a scientific point of view, though perhaps a far less expensive description of communication might be attained, and though not so comprehensive, yet answer all the purposes of the trade of this river.

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It has been proposed to sink the bed of the river, from the commencement of the obstruction at Clare Bridge to the termination, a furlong above it at the old mill dam, so as to allow vessels to float up the river with the tide; two of the arches of the bridge for this purpose being thrown into one, and form a swivel bridge in the space of the two arches.

The object here appears to do away with the lock.

It is also proposed to have a towing-path on the west side of the river, 10 to 20 feet broad, all the way to Ennis, for horses to tow vessels up; and likewise to cut a canal from the centre of the river at a quay called the Gaol Quay, at right angles to the river, through a field, up to the town of Ennis, and there to excavate a basin or dock with suitable quays, &c.

This plan, or any project having for its basis a free passage for the water, both up and down, without locks, gates or anything to keep the water under control, will, in my opinion, not only prove inadequate, but will destroy the navigation of the Upper Fergus, and render it necessary to incur immense expense, by being obliged to deepen the river in many parts equal to the quantity cut away at the falls or rapids. At present some part of the Upper Fergus has barely 13 feet at low water, and this is retained by the obstruction at Clare; therefore if you cut away six or eight feet of this natural dam, you lower the whole river by that quantity, leaving in some parts but six feet water; hence the necessity of deepening those places that have not more than 13 feet. The next and most serious objection to this plan in a nautical point of view is this: the tides fall at the springs very rapidly, viz. seven feet during the first two hours of the ebb, and by the third hour nine feet, and in fact falling nearly the whole quantity in the first half of the tide; of course that part which it is proposed to cut down, viz. from the old dam to the bridge, will be dry at low water, or nearly so; consequently, at half-tide you will have barely four or five feet over this rocky bed of limestone. Now I will suppose, what must often happen if this course is pursued, that a vessel bound up the Fergus to Ennis leaves the quays of Clare at last-quarter flood, or earlier, with a strong head wind, and has to warp up the river, in the winter of course against the freshes, which run over tide; in many instances we should find it would be difficult to get the vessel past the shallows before the tide of ebb would make, after which it would be next to impossible to get her over or past the angle of the river into deep water. The consequence would be, the sudden falling of the tide would leave her aground on the hard bed of the river, and the force of the stream, which would be much greater than at present, might cause serious damage. The retrograde step would be, if not impossible, very dangerous. This view of the case is allowing every precaution and skill in the conducting of the vessel; but as we know merchant ships generally are short manned, and sometimes carelessly managed, accidents of this kind would in all probability frequently happen. Capsterns are but slow and awkward machines for warping, and not at all adapted to perform work like this, which should be both rapid and powerful; they would be rather a hindrance than otherwise. As for horses, their power could not be easily applied. The most feasible would be a small steam tug-boat, of 20-horse power. It has been proposed in all plans I have seen, to form a towing-path on the west side of the river, five feet high, and from 15 to 20 broad; the expense, I believe, is estimated from 1,500 *l.* to 4,000 *l.* Instead of this towing-path, which is intended to take four horses abreast, I would suggest a small steam tug-boat, as I have before mentioned. The yearly expense of such a vessel, of 20-horse power, which are in common use on the Clyde, would be under 200 *l.* per annum, supposing her to be in constant work; the prime cost would be about 1,200 *l.* This estimation is from returns made to me, for furnishing the Survey with a steam vessel of the above description.

The towing-path would be in want of constant repairs, from the continual trampling of the horses; and besides this, a vessel would be found very clumsy to tow up in this manner, as her masts, yards, rigging, &c. would hold the wind, and offer five times the resistance that her hull would do, and of course likely to cause her to sheer alongside the banks *.

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* This objection would exist by either method of towing.

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I have perhaps digressed a little from the direct line of that share of the Commission which has been allotted as my special task, by alluding to such work as more properly belongs to a civil engineer; but the question here appears so blended with that of a nautical inquiry, that I rather preferred overstepping the line at the risk of criticism, than falling short of any part, and especially one which appears to me of serious consequence.

Trade.

Having obtained all the information that circumstances would admit relating to the navigation of the Fergus, and nautical subjects connected with it, I availed myself of an opportunity of procuring a return of the exports and imports of Ennis and Clare, either by way of Clare or Limerick. Here it may be necessary to remark, that by far the greater part of the produce of the county of Clare finds its way to Limerick markets by land, at a very large expense of carriage, and also the articles introduced into Ennis or Clare in general are conveyed by land; even the greater part of the coals consumed are brought at a charge for land carriage of 13*s.* 6*d.* per ton. There is no reason why the River Fergus should be thus overlooked, and those natural advantages that this county and town possess entirely neglected. Though the present state of the Fergus, and especially the wretched quay at Clare, are by no means adequate, or even at all times available, yet even the advantages the river in its present state affords they do not embrace. This circumstance would lead us to imagine that any improvements that are made may share the same neglect, and especially if any toll or taxes are placed on them.

The sum of 400*l.* or 500*l.* well laid out would build wharfs sufficient to accommodate five or six vessels at a time, which would afford the means of the merchants shipping their grain direct to Liverpool, whereas a very large proportion is taken to Limerick on cars, at the charge of 12*s.* 6*d.* and 13*s.* per ton. All the iron brought to Ennis incurs the enormous land carriage of 8*d.* per hundred.

From these few facts it is evident there must be some great drawback to commercial enterprize, or otherwise shrewd people, as those I have seen in Clare appear to be, would hardly pay extravagant prices for land carriage, always at the risk of the wet damaging their articles, when by a trifling contribution among themselves they might obtain all the accommodation necessary to be independent of Limerick as a market, and make a profitable and sure return for the money so expended.

The same cause that operates to deter the spirit of speculative enterprize in one instance, would also be found to cramp or defeat it in another; and therefore if any improvements are made in the way of cutting a canal to Ennis, or erecting piers or wharfs, it must be as a boon, or the proprietors of the soil contiguous must sacrifice some large portion of their present interests, and show themselves personally disinterested and foremost in the cause, to ensure permanent advantages to the community.

Embankments for bringing the mud shores of the Fergus under cultivation are well worthy consideration; there are many thousands of acres that might be gained from the sea at comparatively a small outlay.

Some part of the banks above the Bolan are nine or 10 feet above low-water mark, and therefore would not require an embankment of more than seven or eight feet; and the extensive flats near the mouth of the Fergus dry about last quarter ebb, though in shore it begins to leave the mud at the first falling of the tide, progressively leaving the banks bare for two miles in extent. By judicious management large portions might be taken in with a sure and profitable return; but as this is a question purely belonging to a civil engineer, I deem it unnecessary to say more upon the subject.

State of the Roads.

I cannot help remarking, however out of place, that the roads between Limerick and Ennis are in a most disgraceful state, and that part from Clare to Ennis is almost impassable; indeed it is so bad that the mail coach has been within these few days obliged to proceed by another route, though I am informed not much better. The road leading from the Quay to Clare is two feet deep in mire, and full of pits and holes, nor could I learn whether or not it was likely to be repaired.

Towns of Clare and Ennis.

It is necessary to have some idea of the relative importance of the two towns of Clare and Ennis, because on this question depends the propriety of bringing the

No. 7. Report of Capt. Mudge, on the Navigation of the Fergus.

the shipping up to the town of Ennis by means of a canal, and excavating docks, &c. During the time I was stopping at these places, I became impressed with the conviction that the only proper and desirable place for the shipping to remain and discharge would be in the Upper Fergus, and all the improvements, such as wharfs, &c. should be constructed along its banks; for why should we forsake the fine, deep and almost still water, which nature has given, to construct a canal to take vessels up to a crowded and narrow street, not sufficient to admit two carriages to pass without the danger of running over the foot passengers, who are obliged to squeeze themselves into any nook or doorway to avoid being trampled on? Besides these inconveniences, Ennis is not a manufacturing town; and though it is the focus of a large agricultural county, there are no warehouses or stores of any importance, and the markets where all the grain, butter, &c. are sold, are in a confined and narrow space. Two or three good roads leading to the river, something less than a quarter of a mile from the heart of the town, would be more serviceable than bringing a canal at considerable expense to the present confined and narrow streets of Ennis: then the town would be extended, and be built by degrees spacious and commodious. Stores for grain and other necessary buildings would spring up; a new and old town would be united, similar to Limerick and most other commercial towns, and of course the new town would be adapted to our present civilized and extended notions of commerce.

Clare is a small and wretched village, and owes its existence to its proximity to the river; it consists of a few miserable and poor hovels, some without even a thatch. You may here and there see a slated cabin, but the whole is a picture of misery and distress.

Summary of proposed Improvements.

The few improvements that I consider necessary for the navigation of the river, from the mouth to Clare, are enumerated under:

First, The small rock on Carrigtrawara Rock, requires one buoy.
The rock inside of it, one buoy.
The Horse Rock, one buoy.
The Moylan's Children, one buoy each.
Moylan's Rock, one buoy.
Brakinish Rock, one buoy.
Between Moylan's Rock, and Brakinish Rock, on the mud, one buoy.
Abreast of the anchorage off Low Island, one buoy.
At the Swashway, one buoy.
Priest Rock requires a beacon or stone pillar.
The mud opposite the Priest Rock requires one buoy.
The Roadway Rock requires a beacon or stone pillar.
On the mud off Coney Island near the second anchorage, one buoy.
On the Point of Finish, one buoy.
On the Muscle Bank, one buoy.
On each side the river between the Muscle Bank and Bolan, at nearly equal distances, two buoys.
The Bolan should be taken up; and if not, a beacon should be put on it.
Opposite Bolan, on the mud, one buoy.
Between Craw Island and the Bolan Rock there should be three buoys.
The bar at Craw Island, as a matter of necessity, should be removed.
On the mud spit opposite Asullas River, one buoy.
On the spit of the Asullas River, one buoy.
Carnally Bar should be taken up, and all the stones on the bank near it should be removed.

These are, in my opinion, all the improvements required to make the navigation of the Fergus far safer and easier than the Shannon, from the Grass Island to Limerick.

I have the honour to be, Sir,
Your most obedient and very humble servant,
W. Mudge.

Colonel Burgoyne, &c. &c.

EXPORTS

EXPORTS from the Town of ENNIS and from the County CLARE, 1831: from Returns.

—	Barrels.	Tons.	Proposed Charge per Ton.	Gross Amount at present.	Estimated Increase at the End of Five Years.	REMARKS.
			d.	£. *s.*	£.	
Wheat - - -	24,000	3,000	at 6	75 –	150	At present all the Grain of the surrounding country goes to Limerick by land, at a charge of 13*s.* per ton. The Pigs are all driven to Limerick.
Oats - - - -	96,000	8,000	– 6	200 –	400	
Barley - - -	10,000	2,000	– 6	50 –	120	
Beans - - -	- -	300	– 6	12 10	25	
Butter - - -	Not known.		—	—	—	
Bacon - - -	Not known.		—	—	—	
Cattle - - -	Not known.		—	—	—	
The present and future Return at the expiration of Five Years - - - - £.				337 10	675	

IMPORTS, Estimated from the best Information.

—	TONS.	Proposed Charge per Ton.	Gross Amount at present.	Estimated Increase at the End of Five Years.	REMARKS.
		s. *d.*	£. *s.*	£. *s.*	
Timber - - -	1,000	– 9	37 10	75 –	All the Timber is carried by land from Limerick to Clare, at 13*s.* per load. Iron brought at 8*d.* per cwt., and all other articles at 13*s.* per car load. Coals at 13*s.* per ton: by this means, Coals that are burnt in Limerick at 22*s.* per ton, would cost at Clare 35*s.*
Iron - - - -	500	– 9	18 15	37 10	
Salt - - - -	500	– 9	18 15	37 10	
Coals - - -	2,500	– 9	98 15	187 10	
Slate - - -	500	– 9	18 15	37 10	
Flags Slate - -	500	– 9	18 15	18 15	
Bricks - - -	1,000	– 3	12 10	25 –	
Whisky - - -	500	– 6	12 10	12 10	
Earthenware - -	500 measurement.	1 –	25 –	50 –	
Glass - - -	100 measurement.	1 –	5 –	10 –	
Sugar - - -	300	1 –	15 –	30 –	
Tobacco - - -	200	1 –	10 –	20 –	
Merchants' Goods and Sundries - -	1,500 measurement.	1 –	75 –	150 –	
Boats bringing Sea-weed, Turf, &c. -	200 per month: 2,400.	1 –	—	120 –	
Total of the present and future Returns on Exports and Imports - - - - £.			703 15	1,486 5	

— No. 8. —

No. 8.

Report on the state of Wellesley Bridge and Dock.

REPORT from Captain *Mudge* and Mr. *Rhodes*, on the State of Wellesley Bridge and Dock; dated 17 December 1831.

AN ACT for the erection of a Bridge across the River Shannon, and of a Floating Dock to accommodate sharp Vessels frequenting the Port of Limerick, was obtained 17th June 1823.

See Plan 5.

The Commissioners appointed for carrying the said works into effect applied to Government for a loan of money, and it appears that 55,384 *l.* was granted for this purpose, under a mortgage of the tolls on all exports and imports, tonnage of vessels, dock dues, &c. &c.

The first stone of these works was laid in the year 1824. The Commissioners from this time, until the 3d January 1827, kept the works in their own hands, carried on by their own engineer, Mr. Baker, and workmen, under the superintendence of Mr. Alexander Nimmo.

From this latter date the works were let by contract to Messrs. Clements and Sons; and during the whole of this period, from the commencement to the present time, it is quite apparent the works have not been carried on with that

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Report on the state of Wellesley Bridge and Dock.

degree of energy that might have been expected, and which its importance demanded; and at present every part is unfinished, and far from a state of completion.

The Bridge.

The bridge now building is of limestone; the roadway to be 40 feet wide. It is composed of five arches of 70 feet span each; the outer part the segment of a circle, whose versed sine is eight feet, measured from the springing to the soffit; the internal part a semi-ellipse, and similar in principle to the bridge at Neuilly, built by Perronet.

The piers for supporting the arches are 10 feet thick, four in number, and all founded upon the rock, and were set or built by means of the diving bell, sunk 11 feet under low-water mark.

Both of the land abutments are also built; on the north side the arch is turned, and the south abutment is built to the level of the springing.

Three of the arches are now turned and complete, with their spandril walls, &c.; the fourth is about one-third turned, and all the stones are ready for setting.

The fifth arch is not yet commenced, nor the centres erected, it being found necessary to remain free and open for the admission of vessels passing up and down the river to the different quays, until the lock gates and bridges are fixed in their places, which, from the information we have obtained on the subject, is not likely very soon to be the case, there being some disputed points yet unsettled between the contractors and Commissioners regarding the specifications and drawings of the bridges and lock gates, &c., arising from a want of explanatory detail in the original plans, specifications and contract deeds; also from having other drawings made out by order of the Commissioners and their engineer, and given to the contractors, entering more into detail than the former ones; but which drawings, although more explanatory, appear to be of a much more expensive nature than those attached to the original contract, by which the contractors made their estimate: against this the contractors have frequently remonstrated (as appears by their letters), but up to the present time no satisfactory adjustment has been effected; this is much to be regretted, as the works, in consequence, are left in a precarious state, of which the parties do not seem sufficiently aware.

Since our arrival here two vessels have ran foul of the centering of the third arch, breaking the tie-beam and king-post of one of the ribs, and otherwise damaging it; fortunately this arch had been closed a few days previous to the accident, or the result might have been destructive to the greater part of the bridge. This is one of the many examples which show the necessity of proceeding more speedily to the completion of the work, that the waterway of the arches may be opened to their full capacity.

Having examined the quarry and the works prepared, it appears that all the arch-stones required to complete the fourth and fifth arches are ready to be set in their places, as also the greater part of the balusters, parapet and coping.

The bridge piers are built of well-dressed stone joints, and beds good and perfect, as are also the arch-stones; but a defect appears in the arch-stones or voussoirs not being of sufficient depth from the springing nearly to the centre of arch; also better masonry in the horizontal courses would have resulted by arranging the voussoirs so that so many small closers would not have been required: this would have added to the appearance, and made the works more perfect.

The centre of the land arch, north side, is struck and cleared away; this arch appears to have settled a few inches, which has caused the different joints of the soffit of the arch to open, and towards the springing some of the stones are flushed at the joints, in consequence of the increased pressure on the face of the work at this part: this settlement may have been partly caused by the abutment walls not being sufficiently backed up to form a greater resistance, and also by compression in the various joints, not unusual in flat arches. The general character of this work, however, is that of soundness and stability, and it is well executed, with the exception of the above-related facts.

The Dock.

The Dock or Basin, with its entrance, and the lock which is to form a passage to the intended floating dock, as also the river walls, capstern holes, &c. are all built up to the height of the underside of coping, but are very far from a state of completion, several parts of the foundations of dock walls being very leaky, arising, it is presumed, from the insufficiency of the puddling at the back of

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of the walls, and from the work not being properly connected to the solid rock, but built upon a loose shingly substance which permits the water to flow through the fissures, and the greater part of the mortar is now washed out of the joints by the influx and reflux of the tides; from which it appears that this part of the works will not be found to possess the intended accommodation for vessels, as water sufficient for a floating basin can hardly be retained when the tide leaves it, and it will also be attended with much difficulty and expense to prevent this leakage.

The hollow quoins and recesses are nearly in a state of readiness to receive the lock gates, as are also the foundations for the bascule and swivel bridges; but in consequence of the division of opinion between the Commissioners and contractors, the lock-gates, bridges, and their appendages, are not yet ordered, which is much to be regretted, as these are works which must necessarily occupy considerable time in their preparation.

The entrance and tide lock are both built with good and well-dressed limestone, apparently well bedded and jointed; the hollow quoins and recesses for the gates are well executed, but the water being now six or seven feet in depth over the bottom, ebbing and flowing with the tide within the dams, it is impossible to form any decided opinion upon that part of the work.

See Plan No. 5.

We beg to remark (which will be seen by observing the accompanying Plan) that the basin is about 200 feet in length by 100 feet broad, therefore capable of containing only three moderate sized ships, two on the south and one on the north side, or about six small coasting vessels, leaving a passage of 40 feet in the centre for vessels passing to the custom-house and other quays. This space for the accommodation of shipping is very inadequate for the improving trade of the port of Limerick, and in fact may he considered useless, unless the wall is constructed for making the intended floating dock, which at present is not calculated upon; the estimate for which is about 24,000 *l.*

We also beg to remark that in our opinion the site chosen for this bridge, basin, &c. appears to have been fixed upon without that due consideration which a subject of such vital importance demanded; this will be apparent by a mere glance at the map of the river: the natural channel is contracted, causing a head of water above, and thereby increasing the current below bridge, and this too at a part of the river where it is considerably narrower than in the vicinity immediately above or below the bridge.

BASCULE.

Bascule.

According to the plans and sections now laid down, the Bascule Bridge is intended to rest upon the general level of the coping, or two feet above Kelly's Quay, making the ascent from the Bascule to the Wellesley Bridge eight feet horizontal to one perpendicular; in consequence of this steep ascent the Bascule foundation will have to be raised nearly seven feet, and the road leading to Brunswick-street will have to be raised in proportion to a rise equal to 1 in 35, with the approaches on each side leading to the sides of the lock, and also the approaches on the north side, causing extra embankments and retaining walls; this expense forms a considerable item in the sum now applied for, not being included in the previous estimate.

With regard to the Bascule Bridge we consider the principle very inapplicable, and not suitable for docks, ship-canals, &c., as, when raised, its perpendicular height, added to the height of the side walls, will be about 30 feet above surface of water, spring tides, and will be found very inconvenient, as the rigging, yards, bowsprit, or anything projecting from the hull of the ship, will be liable to get entangled and injure some part of its machinery or framework.

Swivel Bridge.

Therefore we should recommend a swivel bridge in preference to the bascule principle, being more simple in construction, compact, easier moved, and less liable to get out of order.

Considerable improvement may also be made relative to the swivel bridge at the pier head, lock gates, and their working machinery, capsterns, &c. &c.; but as this is not the proper place, we decline entering into details on this subject.

Soundings.
See Plan 5.

We have thought it necessary to the fulfilling this Report with accuracy to compare the depths of water in the vicinity of the bridge at the present time, with those exhibited on the accompanying Plan, which we suppose were taken

No. 8. Report on the state of Wellesley Bridge and Dock.

taken when the work was first designed. The figures marked in squares are the original depth, and those encircled were obtained in the most accurate manner by ourselves, with reference to the same fixed points, viz. Kelly's quay, the top of which is mentioned in the Plan as being the rise of the highest spring tides; it will be seen the difference amounts to one or two feet. The result of this part of the examination tends to strengthen the opinion that the site chosen for this dock is not the most eligible spot. At the dock gates the greatest depth of water at the top of an extraordinary spring tide has never, we believe, exceeded 18 feet, consequently the neap tides will not give more than nine or ten feet, which depth of water is insufficient for some of the coasting vessels, and totally inadequate to receive the description of vessels that were first intended and generally supposed would be accommodated. Shipping drawing more than 16 feet will have to discharge some part of their cargo at Grass Island, to ensure sufficient water on the sills of the tide basin, and may also be detained some days waiting for spring tides, as it is obvious neap tides will not afford sufficient water for vessels drawing more than 10 feet.

The lock leading to the intended floating dock in length and breadth is sufficient for a vessel of 800 tons, but there will not generally be more water than will accommodate a ship of 250 tons; the former would probably require 18 feet, and the latter class would vary from 12 to 16 feet when laden. Now the intention was to effect accommodation for sharp vessels, and as some of the dimensions of the lock would imply, equal to 800 tons; how far this has been realized is shown by the foregoing facts, viz. want of sufficient water at ordinary springs, and a complete exclusion during neap tides.

Another point to which we beg to call your attention is, that all vessels of 14 or 15 feet draught, that should not lie aground, are obliged to remain at anchor off Grass Island, which is nine miles below the city, and must start from thence, if they require to go into the dock, at half-flood; from the difficulty of the navigation, without the assistance of a steam vessel, if the wind and other circumstances are not favourable, or should the wind shift when but a mile from the dock gates, it might preclude her entering at the precise time, viz. high water; and she may be so circumstanced, from wind and other causes, that it would be difficult to return to her former anchorage, and of course any loss of time upon a falling tide might be the means of leaving her aground, besides the inconvenience and expense of such delay.

Extension of the wall from the Lock.

We cannot close this Report without again expressing our opinion that, unless the wall from the lock be extended to the custom-house quay, the port of Limerick will not receive any material benefit from the mere tide-basin and lock, which of course, from their nature, are not capable of receiving more than two or three vessels at the same time; and until this port can provide some means for shipping to lie afloat, shipowners in general will not permit their ships to be chartered for Limerick.

Small Craft.

The want of accommodation or docks for the small craft for the inland canal trade requires considerable attention; at present there is no quay set apart for landing goods, but the temporary one along the side of the canal above the first lock.

For this purpose we have sounded the depth of water in the Abbey River, from the first lock to the termination at the river near the custom-house, and which soundings are marked in a circle on the Plan: a considerable quantity of stones, rubbish and other matter having accumulated near Baal's Bridge, which causes the current to flow with great velocity, and it is with considerable difficulty that a canal boat can get up at the present time even at high water.

Other Improvements.

As a very great improvement, we should recommend the whole of this channel to be cleared level with the sill of the first lock gates outwards; and by erecting a lock and gates at the lower end, with a head of water of about 10 feet, the whole might be converted into a fine spacious and commodious dock for small craft, (that might always be afloat,) on the sides of which suitable wharfs and quays might be erected.

At this height of water (10 feet), all the sewers connected with the lower part of the town might be made to carry off their contents by side drains made for that purpose alongside of the present quay walls, and the periodical overflow of much land in the vicinity would be prevented, as a system of drainage would thus be established.

It

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It would also be necessary to build a lock and sluices at the upper end, where the river enters from the Shannon, to prevent the water flowing through in greater quantities than might be wanted.

As this is a subject connected with the Limerick Canal Navigation, we deem it unnecessary to add more until that is treated of.

W. Mudge.
Thos. Rhodes.

Limerick, 17 December 1831.

— No. 9. —

No. 9.
Report on the Navigation from Limerick to Killaloe.

REPORT upon Canal and River Navigation from *Limerick* to *Killaloe*; dated 28th February 1832.

See Plan No. 6.

HAVING, in pursuance of that part of my instructions which directs a survey to be made of this part of the Shannon Navigation, proceeded and taken a general view along the line from Limerick to Killaloe, I found from various appearances, and the dilapidated, neglected or unfinished state of the Works, that it would be necessary to make a particular examination, with survey of the whole line of the canal and river navigation, drainage, &c., and of the circumstances connected therewith.

I accordingly commenced with my assistants by making and fixing gauges on the lock gates, &c., at each of the locks connected with the river, viz. Limerick, Park, Annaghbeg, Errina, Cussane and Killaloe, and also at Castle Connell, O'Brien's Bridge and Parteen Rapid; these gauges are made of fir timber, about 10 feet in length and 5 inches broad, the ground of which is painted white, and marked and figured black, graduated into feet and inches, and are for the purpose of ascertaining and registering daily the rise and fall of the water during both winter and summer seasons, and to compare the discharge and velocity of the currents at the different places, and also to ascertain the practicability of reducing the surface of Lough Derg in winter, or during the floods, to the summer level; also to compare the depths of water over the gate sills with the depths of water in the canal during the time of making the necessary soundings, which was done, by means of a graduated rod, at every 50 feet distance on the whole line of the canal.

From this investigation, it appears that deepening is required in a great number of places, and for a considerable distance, and at some places it is apprehended the bottom has never been executed to the required depth; this, with slips taking place at the side slopes, from being made too perpendicular, which, added to the superincumbent weight of the high banks, has forced them into the bottom, and also from cattle and pigs being allowed to graze and root up the banks and towing-paths, which shows great neglect on the part of the managers and lock-keepers, to whose care these matters are generally entrusted, and by them they ought to have been preserved. This accumulation of gravel, clay and other matter at the bottom and sides of the canal, is in some places upwards of four feet above the level of the gate-sills; and as the canal is only intended and made for six feet water over the sills, during the dry seasons it leaves only two feet depth of water over those parts for vessels to navigate, which I am informed was the case during a considerable period last summer, and was the cause of very great delay, by having to lighten the vessels from one to the other, to enable them to pass over the shoal parts.

The locks and bridges in general are out of repair, the joints of the masonry being open, and grass growing out; the clapping sills being of stone, the water-tight edges and joints are broken off and otherwise damaged, and cause considerable leakage; hollow quoins in the same state; coping of chamber and wing walls in many places knocked off; and some of the gates, sluices and swing bars require repair.

As it is necessary for the fulfilment of this part of my duty to enter more into the detail and particulars of each part, I shall commence at the river near the custom-house, Limerick, and continue on to Killaloe, explaining the different parts treated of.

No. 9.
Report on the Navigation from Limerick to Killaloe.

Custom-house Quay to First Lock.

From the custom-house quay to the first lock, the distance is about 1,800 feet, and the width of the river 138 feet, with tolerable good quay walls on each side, built with squared ashlar stone; the space between these walls might be converted, at a moderate expense, into a spacious dock for the accommodation of small craft navigating the canal, which might lie afloat at all times of the tide; and for this purpose it appears to have been intended at the time when the canal was first constructed, as part of the tide lock is now standing, with the remains of the hollow quoins and recesses for the gates, &c.; but for some reason, which I have not been able to learn, this scheme was abandoned.

A considerable quantity of the water of the River Shannon runs down this passage or gut, causing a great current from Baal's Bridge downwards, so that in times of floods, or even at high water, it is almost impossible to get vessels up; and the arch of this bridge has been constructed so low that it will not admit of a light vessel to pass under it, which renders this part of the navigation almost useless; the arch is about 60 feet span, and rises about eight feet six inches, but at spring tides the water rises to within six feet six inches; and extraordinary springs, to within four feet six inches of the top of the arch.

Baal's Bridge is built of good materials, and the workmanship is equally good, but the design appears not suitable for this situation: 1st, the arch being too low for the purposes of navigation; 2dly, the roadway over the arch is too high, and makes it very inconvenient for carriages passing over it from the quays on each side, causing a great draught for horses drawing laden cars, &c. over it.

By contracting the two abutments of this bridge to 45 or 50 feet, and constructing an iron arch swivel bridge, it would have answered the purpose much better; the roadway then might have been on a level with the quays, and by opening each leaf, vessels might have passed with the greatest ease and security, and the total expense in the construction considerably less than the present one.

From the custom-house quay to the first lock, a great quantity of stones and loose gravelly matter has accumulated, which I apprehend is chiefly the old materials from Baal's Bridge. The depth of water will be seen by reference to this part of the Plan, and from the soundings taken from the sill of lower gates; and to make the navigation passable, this rubbish ought to be cleared away.

Table of Soundings from Custom-house Quay to First Lock.

Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.
	Ft. In.	Ft. In.	Feet.	Ft. In.	Ft. In.	Feet.	Ft. In.	Ft. In.
Angle of Custom-house Quay.	14 4	—	500	10 9	1 1	1,100	8 9	3 1
50 ft.	13 10	—	550	11 0	0 10	1,150	11 10	—
100	14 0	—	600	10 3	1 7	1,200	9 0	2 10
150	13 10	—	650	11 6	0 4	1,250	8 0	3 10
200	13 0	—	700	10 9	1 1	1,300	9 6	2 4
250	12 9	—	750	11 0	0 10	1,350	6 10	5 0
300	12 0	—	800	10 0	1 10	1,400	8 3	3 7
350	11 10	—	850	10 9	1 1	1,450	8 0	3 10
400	11 10	—	900	10 9	1 1	1,500	8 9	3 1
450.	11 3	0 7	950	12 0	—	1,550	11 10	Lower Sill of Lock.
			1,000	11 0	0 10			
			1,050	8 9	3 1			

Thus it appears from a reference to this Table, that it requires to be deepened five feet, which would, at the present time, very much facilitate the passage of vessels from the canal to the river.

See Plan No. 6.

It will be seen by inspecting the Plan, that by erecting a tide lock with gates and sluices at the river entrance (marked A on the Plan), with a depth or head of water of about 10 feet over the sills, with reverse gates to prevent the tide flowing above this height, the whole would form a convenient and useful dock.

In

No. 9. Report on the Navigation from Limerick to Killaloe.

In addition to this, a lock would be required at about the middle of Salmon-weir River (marked B on the Plan), to prevent the river flowing through, or only occasionally, to supply the dock with water, as might be wanted; by adopting these means and securing the embankments, a system of drainage would be established at all times, and would prevent the periodical overflow of water on the lands on each side of the canal and Salmon-weir River, which are submerged for several months in the year and rendered almost useless, and would add considerably to the health and comforts of the inhabitants of the lower part of the city.

First, or Limerick Lock.

This lock is built of good squared limestone, length between the gates 127 feet; width at the hollow quoins 21 feet, and swelled out in the chamber part; both sets of gates are perfect and in good repair, the lower ones having been put up last May, and the upper ones about four years ago, but they require a coat of paint and tar; the side walls require to have the grass picked out of the joints of the masonry, and grouting and pointing with Roman cement; the coping also is much neglected and requires the same mode of treatment.

The clapping sills being of stone the water-tight edges are broken off, and the water having washed the mortar out of the joints causes considerable leakage; this part and the bottom part of the lock cannot be repaired without drawing off the water.

A considerable quantity of gravelly rubbish has collected in the chamber of this lock, to the depth of nearly three feet above the sills of gates, which requires clearing away.

The accommodation bridge across this lock, leading to the corn mill, is built of substantial brickwork, the arch of which is so very low that it appears as if it had been the intention for the canal to terminate at this place, for a light vessel cannot pass until the level of the canal is drawn down several feet, which renders it very inconvenient and the cause of great delay; therefore I would recommend its being taking down and a swivel bridge erected, which would enable vessels to pass at all times with despatch.

Soundings taken from First to Second Lock.

For Section, see Plan 21. Fig. 2.

Distances.	Depths.	Required Deepening	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.
	Ft. In.	Ft. In.	Feet.	Ft. In.	Ft. In.	Feet.	Ft. In.	Ft. In.
On Sill -	10 2	—	850	8 3	2 4	1,700	8 0	2 8
50ft.	9 6	1 2	900	8 4	2 5	1,750	8 0	2 8
100	10 0	0 8	950	8 5	2 4	1,800	7 9	2 11
150	9 10	0 10	1,000	8 3	2 3	1,850	8 0	2 8
200	9 9	0 11	1,050	7 9	2 5	1,900	6 5	4 3
250	9 6	1 2	1,100	7 8	2 11	1,950	8 0	2 8
300	8 8	2 0	1,150	7 8	3 0	2,000	7 9	2 11
350	6 6	4 2	1,200	8 0	3 0	2,050	7 0	3 8
400	7 3	3 5	1,250	8 0	2 8	2,100	9 3	1 5
450	8 9	1 11	1,300	8 0	2 8	2,142	10 3	on Sill.
500	9 9	0 11	1,350	8 0	2 8			
550	8 9	1 11	1,400	8 0	2 8		43)	99 3
600	8 3	2 5	1,450	7 9	2 8			
650	8 3	2 5	1,500	7 0	3 8	Average	- -	2 4
700	8 3	2 5	1,550	11 9	—			
750	9 0	2 5	1,600	8 0	2 8			
800	8 4	1 8	1,650	8 0	2 8			

Thus it appears by the above Table of Soundings, that part of the canal requires four feet three inches deepening, and the greater number of places nearly three feet, and on an average upon the whole length, two feet four inches in the centre part; making about three feet with the curves to the side slopes; hence 2,150 ft. × 30 ft. × 3 ft. = 7,166 cubic yards; which total of 7,166 yards require to be excavated.

The corn mill, which is situated at the lower end of the canal, is supplied with water from the canal for driving the water-wheels, which causes a constant ebb

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ebb and flow of the water, from which the banks in this part are constantly washing and slipping down into the bottom. I am informed the owners of the mill pay the Limerick Canal Company the yearly rent of 100*l.* per annum for the use of the water; this sum I do not consider equivalent to the damage and delay caused by the mill to the canal banks and the trade.

The towing-path and the top bank on the opposite side are in tolerable good repair, but require trimming and gravelling.

Second, or Park Lock.

This lock is built of limestone (ashlar work); the length between the gates is 72 ft. 3 in. and width 15 ft. 9 in. at the hollow quoins; all the coping requires to be taken off and reset with good water cement mortar, and the outside joints pointing with Roman cement.

All the joints in the chamber of the lock and wing walls require to be well raked out, and pointed with cement.

The retaining walls at the lower end of the lock are too low, and should be built up level with the coping at one end, and even with the bank at the other; also at the upper end, passing under the accommodation bridge, the wing wall is so very short that it is dangerous for the horses towing the boats; the clapping sills are of stone, and are in the same condition as the first lock, broken and chipped off, causing great leakage.

On each side of the lock the banks require raising and filling up, with a coating of gravel on the top.

The accommodation bridge at the upper end of this lock is built of rubble stone, and requires pointing and some light repairs, and the walls at south end rebuilding, and roadway making good.

Two new mooring posts are wanted, and the situation to be altered; viz. one at each end instead of the middle, and the same is required at most of the other locks.

Lock-keeper's house: The roof in a very dilapidated state, one new window wanted, and two to be repaired, ceiling required, being none at present; new door wanted, and shutters to two windows or openings.

A sufficient quantity of ground for a good garden is now lying waste, and the lock-keeper prohibited from taking it; wages 9 *l.* 4 *s.* 8 *d.* per annum.

Soundings from Park Lock to Entrance from River.

Distances.	Depths.		Required Deepening.		Distances.	Depths.		Required Deepening.		Distances.	Depths.		Required Deepening.	
	ft.	*in.*	*ft.*	*in.*	*ft.*	*ft.*	*in.*	*ft.*	*in.*	*ft.*	*ft.*	*in.*	*ft.*	*in.*
On Sill	12	9	—		950	11	0	2	3	2,000	10	3	3	0
Under Bridge	12	3	1	0	1,000	11	3	2	0	2,050	10	9	2	6
50ft.	11	11	1	4	1,050	10	8	2	7	2,100	11	2	2	1
100	10	10	2	5	1,100	10	4	2	11	2,150	11	0	2	3
150	11	5	1	10	1,150	10	3	3	0	2,200	10	11	2	4
200	11	5	1	10	1,200	10	6	2	9	2,250	11	3	2	0
250	11	3	2	0	1,250	10	0	3	3	2,300	11	6	1	9
300	11	3	2	0	1,300	10	4	2	11	2,350	10	7	2	8
350	10	11	2	4	1,350	10	3	3	0	2,400	11	0	2	3
400	10	9	2	6	1,400	10	3	3	0	2,450	10	11	2	4
450	10	9	2	6	1,450	9	10	3	5	2,500	10	11	2	4
500	10	6	2	9	1,500	10	0	3	3	2,550	10	6	2	9
					1,550	10	1	3	2	2,600	11	0	2	3
550	11	0	2	3	1,600	9	9	3	6	2,630	10	3	3	0
600	11	3	2	0	1,650	10	2	3	1	2,650	10	3	3	0
650	11	0	2	3	1,700	8	10	4	5				Head of Canal.	
700	11	0	2	3	1,750	8	9	4	6					
750	10	11	2	4	1,800	8	10	4	5					
800	11	0	2	3	1,850	9	4	3	11			55)	142	7
850	10	11	2	4	1,900	10	7	2	8					
900	11	0	2	3	1,950	11	5	1	10	Average		-	2	9

The foregoing Table shows the average depth of excavation required in the centre part of the canal to be two feet nine inches, and by allowing for the slopes on each side, three feet three inches may safely be taken, rather underrating

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rating the quantity; hence 2,650 ft. × 30 ft. × 3 ft. 3 in. = 9,569 cube yards; required therefore 9,569 cube yards to be cleared from the bottom of this part, to make it efficient for vessels to navigate at all seasons.

Several slips, or watering places, are required for cattle at the north side, as for want of these places they break down the banks; numbers of pigs are allowed to root up the greensward on the sides of the banks, and the fences on both sides are broken down and require considerable repairs; the slopes on each side of the canal are too steep, and by the great weight on the top press the sides into the canal; these should be lightened.

From this place, Arthur's Ferry, to Plassey Mill, soundings were taken in a similar manner to those in the canal, from which the river appears not sufficiently deep with respect to the sills of the gates at Annaghbeg and Park Locks, as may be seen by the following:

Soundings from end of Canal above Park Lock to Plassey Mill, taken at a distance of 50 Feet from the Towing-path.

Distance.	Depth.		Distance.	Depth.		Distance.	Depth.		Distance.	Depth.	
Links.	*Ft.*	*in.*	*Links.*	*Ft.*	*in.*	*Links.*	*Ft.*	*in.*	*Links.*	*Ft.*	*in.*
100	9	0	2,300	18	0	4,500	10	6	6,700	6	6
200	9	0	2,400	13	0	4,600	10	3	6,800	8	3
300	9	3	2,500	13	0	4,700	9	6	6,900	8	3
400	9	6	2,600	13	0	4,800	8	3	7,000	9	9
500	10	3	2,700	11	9	4,900	8	3	7,100	10	9
600	11	0	2,800	11	0	5,000	9	0	7,200	10	6
700	10	9	2,900	10	6	5,100	10	3	7,300	10	0
800	15	0	3,000	8	3	5,200	10	0	7,400	9	0
900	18	0	3,100	9	6	5,300	10	0	7,500	8	6
1,000	18	0	3,200	8	9	5,400	8	6	7,600	9	9
1,100	18	0	3,300	9	6	5,500	8	9	7,700	9	9
1,200	8	3	3,400	10	9	5,600	7	5	7,800	8	6
1,300	8	0	3,500	10	6	5,700	7	9	7,900	8	6
1,400	18	0	3,600	11	3	5,800	7	3	8,000	9	9
1,500	18	0	3,700	11	0	5,900	5	6	8,100	9	9
1,600	18	0	3,800	10	3	6,000	5	9	8,200	11	3
1,700	18	0	3,900	11	3	6,100	5	10	8,300	10	9
1,800	18	0	4,000	11	0	6,200	6	0	8,400	10	6
1,900	18	0	4,100	11	0	6,300	6	6	8,500	10	6
2,000	18	0	4,200	10	9	6,400	6	6	8,600	10	6
2,100	18	0	4,300	10	9	6,500	6	5	8,700	10	0
2,200	18	0	4,400	10	9	6,600	6	3		Plassey Mill.	

The water on the sill of locks being 8 ft. 9 in., it will appear from this Table that 3 ft. 3 in. deepening is required in some parts of the river from Park to Plassey.

The river bank and towing-path from Arthur's Ferry to Plassey Mill appear much too narrow, and the slope next the river is in many places too perpendicular; and by the rise and fall of the river they are continually giving way, and attended with great expense. These slopes ought not to be less than an angle of three horizontal to one perpendicular, finished with sods or greensward, secured with fascines, and the whole planted with furze and broom, the roots of which would run into the banks, and bind them together. Willows planted on the other side of the banks would form a good protection, or the banks might be faced with rock or quarry rubbish, laid about 15 inches or 18 inches thick on the face of slope, built in form of a wall, which may be found cheaper and more durable.

Foot Bridge at Plassey Mill. See Plan 7.

Great inconvenience is felt from the want of a foot-bridge to cross from Plassey Mill to Annaghbeg Lock, for the purpose of towing the packet-boats and trading vessels: at present a ferry-boat is employed for the purpose of taking horses and passengers across the river. The velocity of the current at this place has been ascertained this winter, and found to run at the rate of three

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miles per hour; width of river, 450 feet. Passengers have been obliged frequently to get out of the packet-boat, and be ferried across in the small boat; and trading vessels have been cast ashore upon the bank below, and under the necessity of unloading the cargo into other craft for the purpose of getting off: this is highly dangerous to lives and property. At present a buoy is anchored in the centre of the river, and in times of a flood trading vessels are obliged to run out a cable or warp to this buoy to swing clear of the north bank; and when this is accomplished, they run another warp to the south side to haul them across: this method causes great delay.

I am credibly informed that foot passengers alone, who are in the habit of crossing here, would pay the interest of a bridge; but for the improvement of the navigation alone, I consider a bridge absolutely necessary, and therefore I have now a plan and estimate in preparation for it.

Annaghbeg Lock.

The length of this lock is 80 feet between the gates; width at the hollow quoins of the upper gates, 15 feet 10 inches; and at the lower ones, 15 feet 7½ inches.

The sills of these gates are in a bad state, and very leaky; they are of stone, and similar to the others. Joints of the masonry require to be well raked out, and pointed with Roman cement. The whole of the coping should be taken off and reset, and the principal part to be of new stone, 15 inches in thickness by three feet six inches broad.

The ground on each side of the lock requires raising and levelling from 18 to 24 inches.

The upper gates were put up about five years ago, and lower ones three years; they are both tolerably perfect, but new swing bars at each are required. It appears that no regular attention is paid to the painting and tarring the gates or the sluice machinery.

The lock-keeper states that there was only three feet six inches of water in this lock last summer, from the accumulation of stones, gravel and rubbish collected in the lock, and at the tail of ditto.

At the entrance from the river the bank on the north side is considerably too low, and requires raising five or six feet, and a pier-head formed at the end, projecting a little further into the river, as it would be very useful for vessels mooring to it. The pier-head should be formed of stone, similar in form to the other side, which requires repairing and protecting.

Lock-keeper's House.

The roof is much dilapidated, and requires stripping. Two windows and a door are also wanted, with a ceiling, &c.; in fact, it requires a thorough repair.

SOUNDINGS from the River to Annaghbeg Lock.

Distance.	Depth.		Required Deepening.	
	Ft.	in.	Ft.	in.
Entrance to Canal	11	0	2	6
50 feet -	10	6	1	9
100 -	10	9	1	3
150 -	10	3	2	3
200 -	10	3	2	0
250 -	12	3	—	
300 -	11	10	0	8
350 -	12	0	on Sill.	

Average, 1 ft. 6 in. - - - - 778 yards.

Annaghbeg to Gillogue Lock.

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The banks on both sides of the canal, for a distance of a quarter of a mile, are from 18 inches to two feet too low, and are only a few inches above the present surface of water, even with top bar of upper gate. The soundings between the two locks are as follow:

Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.
	Ft. in.	Ft. in.	Feet.	Ft. in.	Ft. in.	Feet.	Ft. in	Ft. in.
On Sill at Annaghbeg	7 0	—	1,300	7 3	0 3	2,650	6 9	0 9
			1,350	7 3	0 3	2,700	6 7	0 11
50ft.	7 0	0 6	1,400	7 3	0 3	2,750	6 3	1 3
100	8 0	—	1,450	7 6	—	2,800	5 10	1 8
150	8 0	—	1,500	7 6	—	2,850	7 3	0 3
200	7 6	—	1,550	7 6	—	2,900	7 4	0 2
250	7 9	—	1,600	7 0	0 6	2,950	7 3	0 3
300	7 8	—	1,650	7 3	0 3	3,000	7 0	0 6
350	7 9	—	1,700	7 0	0 6	3,050	7 2	0 4
400	7 6	—	1,750	6 11	0 7	3,100	6 9	0 9
450	7 6	—	1,800	7 0	0 6	3,150	7 0	0 6
500	7 9	—	1,850	6 9	0 9	3,200	7 2	0 4
550	7 6	—	1,900	6 10	0 8	3,250	7 0	0 6
600	7 8	—	1,950	6 11	0 7	3,300	7 0	0 6
650	7 6	—	2,000	7 0	0 6	3,350	6 6	0 10
700	7 6	—	2,050	7 0	0 6	3,400	6 5	1 1
750	7 8	—	2,100	7 0	0 6	3,450	6 2	1 4
800	7 3	—	2,150	6 9	0 9	3,500	6 3	1 3
850	7 6	—	2,200	6 0	1 0	3,550	5 11	1 7
900	7 6	—	2,250	6 3	1 3	3,600	6 6	1 0
950	7 5	0 1	2,300	6 4	1 2	3,625	6 5	1 1
1,000	7 3	0 3	2,350	6 5	1 1	3,650	7 0	Sill at Gillogue.
1,050	7 6	—	2,400	7 3	0 3			
1,100	7 6	—	2,450	7 2	0 4			
1,150	7 8	—	2,500	7 2	0 5		73)	31 5
1,200	7 3	0 3	2,550	7 1	0 4			
1,250	7 8	—	2,600	7 2	0 4	Average - -		0 5

From the above Table it appears that some parts of the canal require deepening one foot seven inches from Annaghbeg to Gillogue Lock, and the average for the whole line is five inches; hence 3,650 ft. × 30 ft. × 1 ft. = 4,055 cube yards.

Between these two locks there is a bridge called Gillogue Bridge, the wing and retaining walls of which require repair and part underpriming, as does the bridge over Blackwater River at this point; and the roads and approaches are in a state which requires much repair.

Gillogue Lock is founded upon rock; it is a double lock; the lower chamber being 99 feet 6 inches long, and 15 feet 8 inches wide, and the upper chamber 101 feet 6 inches long, and 15 feet 10 inches wide, each widening in the middle part to 27 feet 6 inches. These chambers are in a very bad state; they are composed of rubble work; the mortar is washed out of the joints, and, from neglect, the walls are in a falling state, and should immediately undergo substantial repair; the retaining walls at tail of lock also require repair and raising to level of the coping; the clapping sills are in a very dilapidated state; the coping requires to be raised; the banks on each side of lock require raising to a level with the coping, and gravelling. There is a considerable leakage on one side of this lock through the bank (owing it appears to the insufficiency of the puddle at the back of the wall) into the back drain, which should be immediately repaired.

The gates of this lock are all perfect, with the exception of one pair, which are now ready to be fixed.

Some accumulation of rubbish has taken place in the lower chamber, which should be removed.

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From GILLOGUE to NEWTOWN LOCK the Soundings are as follows:

Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening	Distances.	Depths.	Required Deepening.
	Ft. In.	Ft. In.	Feet.	Ft. In.	Ft. In.	Feet.	Ft. In.	Ft. In.
On Sill	6 6	—	3,100	6 4	0 8	6,200	5 6	1 6
Feet: 50	7 6	—	3,150	6 7	0 5	6,250	5 7	1 5
100	7 9	—	3,200	6 3	0 9	6,300	5 7	1 5
150	7 8	—	3,250	6 6	0 6	6,350	5 6	1 6
200	7 10	—	3,300	6 3	0 9	6,400	5 3	1 9
250	7 9	—	3,350	6 4	0 8	6,450	5 3	1 9
300	7 8	—	3,400	6 3	0 9	6,500	5 3	1 9
350	7 6	—	3,450	6 3	0 9	6,550	5 4	1 8
400	7 4	—	3,500	6 2	0 10	6,600	5 3	1 9
450	7 3	—	3,550	6 3	0 9	6,650	5 0	2 0
500	7 4	—	3,600	6 0	1 0	6,700	5 1	1 11
550	7 3	—	3,650	5 11	1 1	6,750	5 1	1 11
600	7 0	—	3,700	5 6	1 6	6,800	5 6	1 6
650	7 3	—	3,750	5 6	1 6	6,850	5 6	1 6
700	7 0	—	3,800	5 6	1 6	6,900	5 5	1 7
750	7 3	—	3,850	5 6	1 6	6,950	8	1 4
800	7 0	—	3,900	5 7	1 5	7,000	5 9	1 3
850	7 0	—	3,950	5 9	1 3	7,050	5 3	1 9
900	6 8	—	4,000	6 2	0 10	7,100	5 4	1 8
950	6 7	0 5	4,050	5 11	1 1	7,150	5 3	1 9
1,000	6 9	0 3	4,100	5 11	1 1	7,200	5 2	1 10
1,050	6 3	0 9	4,150	6 2	0 10	7,250	5 5	1 7
1,100	6 8	0 4	4,200	6 2	0 10	7,300	5 1	1 11
1,150	6 3	0 9	4,250	6 0	1 0	7,350	5 6	1 6
1,200	6 6	0 6	4,300	6 2	0 10	7,400	5 5	1 7
1,250	6 4	0 8	4,350	5 10	1 2	7,450	5 8	1 4
1,300	7 0	0 0	4,400	5 10	1 2	7,500	5 10	1 2
1,350	6 6	0 6	4,450	5 9	1 3	7,550	5 8	1 4
1,400	6 6	0 6	4,500	6 0	1 0	7,600	5 7	1 5
1,450	6 6	0 6	4,550	6 3	0 9	7,650	5 8	1 4
1,500	6 9	0 3	4,600	6 3	0 9	7,700	6	1 6
1,550	6 9	0 3	4,650	5 9	1 3	7,750	5 7	1 5
1,600	6 6	0 6	4,700	5 8	1 4	7,800	5 0	1 0
1,650	6 6	0 6	4,750	5 8	1 4	7,850	5 9	1 3
1,700	7 0	0 0	4,800	5 9	1 3	7,900	5 8	1 4
1,750	6 7	0 5	4,850	5 7	1 5	7,950	5 8	1 4
1,800	6 9	0 3	4,900	5 5	1 7	8,000	5 9	1 3
1,850	6 3	0 9	4,950	5 6	1 6	8,050	5 3	1 9
1,900	6 3	0 9	5,000	5 6	1 6	8,100	5 6	1 6
1,950	6 3	0 9	5,050	5 8	1 4	8,150	5 6	1 6
2,000	6 6	0 6	5,100	5 10	1 2	8,200	5 3	1 9
2,050	6 9	0 3	5,150	5 8	1 4	8,250	5 3	1 9
2,100	6 9	0 3	5,200	5 7	1 5	8,300	5 3	1 9
2,150	6 3	0 9	5,250	5 8	1 4	8,350	5 6	1 6
2,200	6 6	0 6	5,300	5 10	1 2	8,400	5 11	1 1
2,250	6 4	0 8	5,350	6 0	1 0	8,450	5 9	1 3
2,300	6 5	0 7	5,400	5 9	1 3	8,500	6 2	0 10
2,350	6 6	0 6	5,450	5 10	1 2	8,550	5 3	1 9
2,400	6 9	0 3	5,500	5 8	1 4	8,600	4 3	2 3
2,450	6 0	1 0	5,550	5 10	1 2	8,650	6 9	0 3
2,500	6 3	0 9	5,600	5 9	1 3	8,700	7 6	—
2,550	6 9	0 3	5,650	5 10	1 2	8,738	6 0	on Sill.
2,600	6 6	0 6	5,700	5 10	1 2			
2,650	6 0	1 0	5,750	5 11	1 1		175)	168 1
2,700	6 3	0 9	5,800	5 8	1 4			
2,750	6 0	1 0	5,850	5 10	1 2			
2,800	6 6	0 6	5,900	5 8	1 4	Average	- -	0 11½
2,850	6 9	0 3	5,950	5 9	1 3			
2,900	6 9	0 3	6,000	5 6	1 6			
2,950	6 9	0 3	6,050	5 9	1 3			
3,000	6 0	1 0	6,100	5 8	1 4			
3,050	6 4	0 8	6,150	5 8	1 4			

From this Table it appears, that in some parts 1 foot 10 inches, and for a small distance 2 feet 9 inches deepening is required, and that an average deepening of of 11 ⅓ inches is required from Gillogue to Newtown Lock; hence 8,738 ft. × 30 ft. × 1 ft. 6 in. = 14,560 cube yards.

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A little below the tail of Newtown Lock there is a very shoal part where laden vessels frequently get aground; this requires immediate attention, as it is the cause of very serious delays: the lock-keeper is obliged to assist the vessels passing up or down, by charging the lock, and then immediately discharging, to obtain force sufficient to clear them by the additional column of water thus produced.

From Gillogue to Newtown Lock the canal banks on both sides to Cappa Villa require raising about 18 inches or two feet, and the towing-path all the way is in a bad state, and requires to be re-made; on the opposite side an accommodation road leading to Cappa Villa requires also to be repaired: this portion of the towing-path is almost impassable in wet weather.

Newtown Lock.

This lock appears in a tolerably sound state; but all the joints require raking and pointing withcement.

The gates are in a tolerably perfect state. The length of the lock is 101 feet 7 inches, and its breadth 15 feet 10 inches in the narrowest part, the middle part of the chamber widening to 26 feet; the banks on each side of the lock require levelling and gravelling.

The bridge called the Wooden Bridge (though built of stone) wants some considerable repairs to the parapets and wing walls; but as this bridge has been built too narrow for the continuation of the towing-path under it, it appears to be advisable to rebuild it of sufficient dimensions for that purpose, as considerable delay takes place in casting off and fixing the towing line in passing it.

From Newtown to Cloonlara the banks require levelling and gravelling; some work has lately been done upon this portion to repair the path, but it appears that instead of gravel, mould is used in many parts, and the stones are not broken small enough, so that immediately upon the occurrence of wet weather it becomes mud and the paths are almost impassable, and under these circumstances the expenditure is almost if not wholly useless; so that it appears a better system of repairs should be adopted, and I would recommend that the stones at present on the banks be dug up and broken small, and laid upon the top six or seven inches thick, and where required additional stone be obtained to make it uniformly of this thickness, and be coated with gravel on the top.

Between Newtown and Cloonlara Lock is Cloonlara Bridge; this is in a tolerably good state of repair.

There appears to be required at this point, or somewhere near to it, a small wharf wall and landing-place, with a crane, to facilitate the loading and unloading of goods, as there is in the immediate vicinity, at Coolisbeg, an excellent limestone quarry, which produces good building materials, the arch-stones of Athlunkara Bridge and various other buildings having been supplied from it. It also appears that this is a central point to a large and populous neighbourhood, including Cloonlara, Doonas, &c., from which a great quantity of produce is weekly conveyed at present by cars to Limerick, and which, it is presumed, but for the want of a proper storehouse and landing-place, would be taken by water conveyance.

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The Soundings from Newtown to Cloonlara Lock are as follows:

Distances.	Depths.		Required Deepening.		Distances.	Depths.		Required Deepening.		Distances.	Depths		Required Deepening.	
	Ft.	in.	Ft.	in.	Feet.	Ft.	in.	Ft.	in.	Ft.	Ft.	in.	Ft.	in.
On Sill	6	9	—		2,100	8	3	—		4,200	6	9	0	6
50 ft.	8	6	—		2,150	9	0	—		4,250	6	9	0	6
100	10	6	—		2,200	8	9	—		4,300	6	9	0	6
150	11	9	—		2,250	8	9	—		4,350	6	9	0	6
200	13	0	—		2,300	9	0	—		4,400	6	9	0	6
250	9	3	—		2,350	9	0	—		4,450	6	6	0	9
300	11	6	—		2,400	9	0	—		4,500	6	9	0	6
350	11	0	—		2,450	9	0	—		4,550	7	0	0	3
400	10	9	—		2,500	8	6	—		4,600	6	6	0	9
450	11	3	—		2,550	8	9	—		4,650	7	0	0	3
500	11	0	—		2,600	9	0	—		4,700	6	6	0	9
550	11	9	—		2,650	8	9	—		4,750	6	6	0	9
600	11	0	—		2,700	8	9	—		4,800	7	0	0	3
650	11	6	—		2,750	8	10	—		4,850	6	6	0	9
700	10	0	—		2,800	8	7	—		4,900	6	9	0	6
750	11	0	—		2,850	8	7	—		4,950	6	9	0	6
800	11	3	—		2,900	8	6	—		5,000	6	9	0	6
850	10	6	—		2,950	8	4	—		5,050	6	6	0	9
900	11	6	—		3,000	8	5	—		5,100	6	6	0	9
950	10	3	—		3,050	8	2	—		5,150	6	8	0	7
1,000	9	3	—		3,100	8	3	—		5,200	6	6	0	9
1,050	8	9	—		3,150	8	4	—		5,250	6	6.	0	9
1,100	8	7	—		3,200	8	4	—		5,300	6	3	1	0
1,150	8	6	—		3,250	8	3	—		5,350	6	6	0	9
1,200	9	0	—		3,300	8	1	—		5,400	6	3	1	0
1,250	9	6	—		3,350	8	3	—		5,450	6	1	1	2
1,300	9	3	—		3,400	8	0	—		5,500	5	11	1	4
1,350	5	6	1	9	3,450	7	9	—		5,550	5	11	1	4
1,400	5	6	1	9	3,500	7	9	—		5,600	6	0	1	3
1,450	5	9	1	6	3,550	7	6	—		5,650	5	11	1	4
1,500	8	0	—		3,600	7	2	0	1	5,700	5	10	1	5
1,550	9	3	—		3,650	7	5	—		5,750	5	10	1	5
1,600	9	3	—		3,700	7	2	0	1	5,800	5	9	1	6
1,650	8	3	—		3,750	7	0	0	3	5,850	5	8	1	7
1,700	9	0	—		3,800	7	0	0	3	5,900	5	6	1	9
1,750	9	0	—		3,850	6	8	0	7	5,950	5	0	2	3
1,800	9	3	—		3,900	6	8	0	7	6,000	5	0	2	3
1,850	8	9	—		3,950	7	2	0	1	6,050	5	9	1	6
1,900	9	3	—		4,000	7	0	0	3	6,100	6	0	1	3
1,950	9	0	—		4,050	6	9	0	6	6,140	5	6	on Sill.	
2,000	9	3	—		4,100	6	8	0	7					
2,050	8	9	—		4,150	6	6	0	9	Average 4½ inches.				

In this distance there are several considerable leakages in the banks on both sides of the canal, which should be examined, as much water accumulates from them upon the low lands, which adds to the inconvenience experienced by the tenants, as hereafter mentioned in speaking of the back drainage.

From this it appears that two feet three inches must be taken out of the bottom in some parts, and that an average deepening of 4½ inches is required throughout; hence 6,140 ft. × 30 ft. × 10 in. = 5,685 cube yards.

Cloonlara Lock.

The lock is 83 feet long, and 15 feet 6 inches in breadth; it is built of ashlar and is tolerably perfect; the joints require to be raked and well pointed with cement.

The gates are good, with the exception of the swing bars to the upper ones, and these should be replaced with oak ones, as should all the others when required.

The bank on one side of lock requires strengthening, and both sides to be made level with coping, and gravelled.

The lock-keeper's house is in a bad state; it requires a ceiling; the roof wants stripping and repairing; a partition and new door is wanted, and the windows require repair.

Soundings

No. 9.
Report on the Navigation from Limerick to Killaloe.

SOUNDINGS from Cloonlara to Monnaskea.

Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.
	Ft. in.	Ft. in.	Ft.	Ft. in.	Ft. in.	Ft.	Ft. in.	Ft. in.
On Sill	5 0	—	450	8 3	—	900	6 3	—
50 ft.	8 0	—	500	7 6	—	950	6 3	—
100	8 0	—	550	7 3	—	1,000	5 6	—
150	9 6	—	600	7 6	—	1,050	5 6	—
200	9 0	—	650	7 0	—	1,100	6 2	—
250	8 6	—	700	7 0	—	1,130	5 9	—
300	8 6	—	750	6 6	—	1,166	4 9	on Sill.
350	6 9	—	800	6 0	—			
400	8 3	—	850	6 0	—			

From which it appears that this portion of the canal is sufficiently deep, as compared with the lock sills.

Monnaskea Lock.

THIS lock is apparently sound, wanting the joints of the masonry to be raked and well pointed with cement; the wing walls at the tail of lock require repair.

The upper gates are leaky, and the sills in nearly the same inefficient state as all the others; the lower gates are sound.

The lock is 83 feet long, and 15 feet 9 inches in breadth. The banks on each side of lock require raising to level of coping, and gravelling.

The lock-keeper's house is in a very bad state; the front wall is going out at the top; the roof requires stripping and repairing; a ceiling is required; new windows and a door are wanted.

The banks from Monnaskea to Errina require to be levelled and gravelled, as before mentioned.

SOUNDINGS from Monnaskea to Errina.

Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.
	Ft. in.	Ft. in.	Ft.	Ft. in.	Ft. in.	Ft.	Ft. in.	Ft. in.
On Sill	5 11	—	450	7 3	—	900	6 7	—
50 ft.	8 0	—	500	7 6	—	950	6 6	—
100	7 0	—	550	7 0	—	1,000	6 6	—
150	8 0	—	600	6 6	—	1,050	6 0	—
200	7 6	—	650	6 6	—	1,100	6 6	—
250	7 9	—	700	6 9	—	1,150	6 0	—
300	6 6	—	750	6 9	—	1,200	5 9	—
350	7 5	—	800	6 9	—	1,250	5 3	—
400	7 3	—	850	6 7	—	1,300	5 11	on Sill.

By this Table it appears that the bottom of canal is of sufficient depth.

Errina Lock.

THIS is a double lock, the lower chamber being 88 feet 4 inches long, and 15 feet 6 inches broad; and the upper chamber 92 feet 6 inches long, and 15 feet 8 inches broad. The walls of this lock appear to be of tolerably sound masonry, with the exception of part of the wall on north side, where a considerable bulge has taken place; this should be examined, as, in the case of a vacuity behind, this should be immediately repaired by puddling, as the side of lock may be forced in by the hydrostatic pressure of water at the back of the wall.

The joints require raking and pointing with cement. There is a considerable leakage from an off-take on one side, at the head of the lock, which should be immediately stopped, as it is calculated to do much mischief to the banks.

The lower and middle gates are in good order; the upper ones are somewhat dilapidated and leaky.

The lock-keeper's house requires a ceiling, the windows to be glazed, and a new entrance door.

From Errina lock to the river, deepening is required in various parts, as appears from the following Table; in some parts as much as four feet must be excavated.

SOUNDINGS

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Report on the Navigation from Limerick to Killaloe.

Soundings from Errina Lock to the River Shannon.

Distances.	Depths.		Required Deepening.		Distances.	Depths.		Required Deepening.		Distances.	Depths.		Required Deepening.	
	Ft.	in.	Ft.	in.	Ft.	Ft.	in.	Ft.	in.	Ft.	Ft.	in.	Ft.	in.
On Sill	11	9	—		2,700	12	6	—		5,400	10	9	1	6
50 ft.	12	0	—		2,750	11	6	—		5,450	10	8	1	7
100	15	0	—		2,800	11	0	1	3	5,500	10	6	1	9
150	19	0	—		2,850	11	9	0	6	5,550	10	7	1	8
200	13	6	—		2,900	11	9	0	6	5,600	10	4	1	11
250	15	0	—		2,950	11	9	0	6	5,650	10	3	2	0
350	15	0	—		3,000	12	0	0	3	5,700	10	3	2	0
300	13	3	—		3,050	11	9	0	6	5,750	9	9	2	6
400	13	0	—		3,100	11	6	0	9	5,800	8	9	3	6
450	12	9	—		3,150	12	0	0	3	5,850	9	3	3	0
500	12	6	—		3,200	11	9	0	6	5,900	10	0	2	3
550	12	6	—		3,250	11	6	0	9	5,950	10	9	1	6
600	12	3	—		3,300	11	3	1	0	6,000	10	9	1	6
650	12	0	0	3	3,350	10	9	1	6	6,050	10	3	2	0
700	12	0	0	3	3,400	11	3	1	0	6,100	10	0	2	3
750	12	0	0	3	3,450	11	3	1	0	6,150	8	3	4	0
800	11	6	0	9	3,500	11	6	0	9	6,200	9	6	2	9
850	11	6	0	9	3,550	11	6	0	9	6,250	10	0	2	3
900	11	9	0	6	3,600	11	5	0	10	6,300	9	9	2	6
950	10	9	1	6	3,650	11	6	0	9	6,350	9	6	2	9
1,000	10	0	2	3	3,700	11	3	1	0	6,400	9	3	3	0
1,050	11	6	0	9	3,750	11	0	1	3	6,450	9	9	2	6
1,100	11	6	0	9	3,800	11	0	1	3	6,500	8	2	4	1
1,150	11	6	0	9	3,850	11	3	1	0	6,550	8	9	3	6
1,200	8	6	3	9	3,900	11	6	0	9	6,600	9	9	2	6
1,250	9	9	2	6	3,950	11	0	1	3	6,650	10	3	2	0
1,300	11	6	0	9	4,000	11	3	1	0	6,700	11	3	1	0
1,350	11	3	1	0	4,050	11	6	0	9	6,750	10	9	1	6
1,400	11	6	0	9	4,100	11	3	1	0	6,800	10	6	1	9
1,450	10	3	2	0	4,150	11	6	0	9	6,850	10	9	1	6
1,500	11	3	1	0	4,200	11	3	1	0	6,900	10	6	1	9
1,550	11	3	1	0	4,250	11	6	0	9	6,950	10	0	2	3
1,600	9	9	2	6	4,300	11	6	0	9	7,000	10	6	1	9
1,650	10	3	2	0	4,350	11	6	0	9	7,150	10	6	1	9
1,700	9	9	2	6	4,400	11	8	0	7	7,170	10	0	2	3
1,750	11	0	1	3	4,450	11	8	0	7				at entrance into River.	
1,800	12	0	0	3	4,500	11	9	0	6	—	9	9	2	6
1,850	11	9	0	6	4,550	11	0	1	3	—	8	3	4	0
1,900	12	0	0	3	4,600	11	3	1	0	—	9	9	2	6
1,950	12	0	0	3	4,650	11	6	0	9	—	9	3	3	0
2,000	11	9	0	6	4,700	11	6	0	9	—	9	6	2	9
2,050	12	0	0	3	4,750	11	6	0	9	—	8	6	3	9
2,100	12	0	0	3	4,800	11	0	1	3	—	8	0	4	3
2,150	12	0	0	3	4,850	11	6	0	9	—	9	0	3	3
2,200	11	6	0	9	4,900	11	3	1	0	—	8	6	3	9
2,250	10	3	2	0	4,950	11	6	0	9			160)	199	8
2,300	10	3	2	0	5,000	11	2	1	1	Average		-	1	3
2,350	10	0	2	3	5,050	11	3	1	0					
2,400	11	2	1	1	5,100	11	3	1	0					
2,450	10	9	1	6	5,150	11	0	1	3					
2,500	11	6	0	9	5,200	11	0	1	3					
2,550	11	6	0	9	5,250	10	9	1	6					
2,600	12	0	0	3	5,300	10	3	2	0					
2,650	12	0	0	3	5,350	10	6	1	9					

Hence it appears that in some parts 4 ft. 3 in. is required to be excavated; and upon the whole of this line an average deepening of 1 ft. 3 in. is required.

7,170 ft. × 30 ft. × 1 ft. 9 in. = 13,941 cube yards require to be excavated.

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Report on the Navigation from Limerick to Killaloe.

Errina Bridge, at a short distance above the lock, on the road from Doonas to O'Brien's Bridge, requires some small repairs to the parapets.

From Errina Lock to the river the canal passes through very deep cutting, the banks of which appear to be too steep, and require to be lightened.

The towing-path has been hitherto on the top of this high bank. A narrow towing-path is now making at a small distance above the surface of canal; but it is submitted that this is doing in a very irregular, temporary and inefficient manner, having already slipped down in several places. There appears to be no proper system of taking away the water which falls from the slope above the path, and unless proper drains are made for that purpose, the water from the upper part of the bank will always be a source of injury to the towing-path.

Where the deep cutting occurs between the Errina Bridge and the river, it is extraordinary to observe the apathy of those who are occupiers or holders of ground adjoining the banks of the canal; for although the surface of the canal is at least 30 feet below the surface of the adjoining grounds, the ditches which should perform the drainage are allowed to remain filled with stagnant water, caused by filling in and making temporary paths across the watercourses, the water from which percolates the embankments of the canal, and causes slips in various parts. If this be in the province of the Canal Company (which appears questionable) it is to be regretted that such a source of injury has been allowed to remain.

Back Drainage.

In the execution of the canal a back drain on both sides appears to have been provided for collecting and carrying off the water from the leakage of the canal, and also from the various land drains intercepted by it; but the opening and cleansing these drains appears not to have been attended to, but very much neglected.

The drainage commences at Limerick Lock, and the watercourses on both sides, from this to the river at Arthur's Ferry, are filled with stagnant water, being choked with weeds and an accumulation of filth and rubbish.

The drain from Arthur's Ferry to Plassey Mill requires some cleansing and repairs of the banks.

At Annaghbeg the drainage commences by a ditch on one side, and the channel cut by the Canal Company for the diversion of Blackwater River on the other, both sides requiring to be cleansed and the banks made up.

At Gillogue Bridge a stoppage begins, where there is an archway over the drain, the walls of which have been suffered to fall in and stop the watercourse.

At Cappa Villa several small arches are much wanted over the drain, the inhabitants having partly filled it in to make a roadway over; it appears that this part of the bank is used as an accommodation road.

Between Cappa Villa and Newtown Lock the Blackwater River was diverted from its original course into the Shannon below Doonas, and carried parallel to the canal on the north side to Annaghbeg, the drainage of the canal and lands adjacent above this point being carried away by the old course and side-drains made for that purpose, the water collected upon the north side of the canal being carried into the same channel by means of culverts constructed under Newtown and Cloonlara Locks: these culverts from neglect having become nearly choked up, prevents the passage of the water, and causes the lands upon the north side of the canal to be inundated; and on the south side, from inattention to the drain originally made by the Company to join the old course of the Blackwater River, the same results occur, overflowing a considerable tract of land (several hundred acres). These inundations are the cause of great complaints both from landlords and tenants; the former complaining that he cannot obtain his rent, and the latter alleging it is impossible, as he is deprived of his land for half the year.

As there is sufficient fall from the canal to the river near Doonas, by cleansing this main branch of the drainage, a very small sum, with proper attention, would be sufficient to remedy these evils, and be the means of keeping many families from starvation; but as the tenants assert that this belongs to the Canal Company, who made the drain originally, and now neglect it, no person is found to pay any attention to these matters, and the injurious consequences as above described are incurred.

No. 9. Report on the Navigation from Limerick to Killaloe.

In trying the levels from the culvert at Newtown Lock, for the distance of 70 chains, or nearly a mile, I found the fall to be 4 ft. 6 in., a fourth part of which is amply sufficient for the purposes of drainage, if properly directed and attended to.

The River from Errina to Cussane.

On leaving the canal the river banks present a very circuitous form to O'Brien's Bridge, which at a moderate expense might be made in a more regular form, and would be of great advantage in lessening the draught of horses in tracking the boats along. There are several places which require dredging, and improvement seems necessary at one place in particular on the west of O'Brien's Bridge, at the corn mill of Messrs. Hood & Co., where the towing-path is very irregular, winding and dangerous; and I should advise an alteration of the line, by commencing at about 150 yards below Messrs. H. & Co.'s mill, with a gentle curve inwards, and continuing it to the north abutment of O'Brien's Bridge. The greater portion of stone required for the retaining wall might be taken from the old walls, founded at the level of low summer water, and the ground wanted for filling or backing up level might be taken from the side banks and bed of river, dredged by the spoon and bay to the required depth of six feet, which would improve the river considerably at this part. The ground reclaimed would make a very commodious wharf, which by means of a good crane would be convenient for landing or shipping off goods of various descriptions to and from the surrounding and populous villages.

O'Brien's Bridge.

See Plan No. 8.

This bridge is composed of 14 arches, of various sizes and forms, from 19 to 28 feet span, the piers for supporting them being from seven to nine feet in thickness; the whole is built of rubble stone of rude workmanship, and by all accounts it has withstood the elements for several centuries. The piers, from every appearance, are founded upon the surface of the bed of river (without any piling), at different depths, and stand upon a marly and limestone gravel. The width of the roadway is 18 feet, roughly paved with pebbles, and protected by a parapet varying from three to four feet in height, coping knocked off in various parts; this seems to have been done by idle and mischievous persons.

The velocity of the current at this bridge during the month of November last was upwards of three miles per hour, calculating 800 feet above and 750 feet below bridge, which was performed in six minutes. Immediately under the bridge the velocity was five miles per hour, and the fall about 10 inches. The four arches next the north abutment being so very narrow, (viz. 19, 23, 23 and 26 feet,) renders the navigation exceedingly dangerous to lives and property, and it is surprising that no more accidents happen.

Vessels laden with merchandize are obliged to stop here for a considerable time, for the purpose of being warped up through the arches by a capstern, which is placed upon a pier projecting into the river 50 feet; and by means of a block affixed to a floating buoy in the river, leading in a line with the large or fourth arch: a rope is dropped through this arch and fastened to the vessel, and being already attached to the capstern, she is by eight or ten men (according to the resistance of the water) hauled through the arch; this mechanical operation causes great delay, and not without serious risk.

To remedy this great inconvenience and risk to lives and property, I would propose taking down the four arches at the north end of bridge, with the land abutment, and the three intermediate piers towards the centre; to dredge the bed of the river to at least seven feet below the lowest summer water, and build the land abutment and trackway for horses, and a centre pier capable of receiving two arches of 60 feet span each, composed of timber or iron. These arches should be flat, and the segment of an ellipse, which would be capable of allowing the canal vessels to pass at all heights of the river, allowance being made for horses to track the vessels up and down without casting off the rope: the whole might be finished with a railing or light parapet, with wing and protecting walls at each side, and there would require a protecting wall at the end, for the purpose of diverging the road east and west.

I should also propose to take away the capstern and its pier, deepening the side of the river from the bridge to about 200 feet above this pier, and bringing the

the retaining wall forwards or into the river 10 feet at the bridge, and diminishing to the present line at 700 feet upwards. This alteration, with that proposed below bridge, (p. 54,) it is submitted, would greatly improve the navigation in this part of the river.

Parteen Rapid.

From O'Brien's Bridge to Parteen Rapid the river is very tranquil, but its banks are circuitous in many places, similar to what has before been stated, and require several of the prominent points taken off, and the side of the bed deepening to admit of vessels coming closer inwards during the dry season.

At Parteen a shoal of hard rock extends itself quite across the river, with a number of eel weirs, damming up the water and causing a considerable head (from 10 to 12 inches).—(Dec.)

The present navigation is on the north side of the river, formed by a channel about 30 feet in width, with a wall next the centre of the river of loose rock, which has been excavated from the bottom and thrown up promiscuously.

In summer the water in this channel has been as low as from three feet six inches to four feet, and in some places less, with angular pieces of sharp rock, or the stone fallen from the wall, sticking up, causing much danger to the vessels navigating.

During the months of November and December last, the velocity of the current flowing through this gut, which is 565 feet in length, was at the rate of three miles per hour, and I was informed that during the summer months the velocity is considerably increased; this is, I presume, caused by the channel being much deeper than the other part of the ridge which crosses the river, (and is at times fordable,) thereby causing a greater quantity of water to flow down the gut or channel, making an increase in velocity.

Two capsterns are fixed near the head of the channel at about 250 feet apart, and used for the purpose of warping vessels up into the still water; this method is attended with great delay and expense in manual labour working the machinery, the time occupied in getting a vessel through this passage being from 30 to 40 minutes.

To obviate the defect in this part of the navigation, dispensing with the capsterns and their appendages, and making it navigable at all times, two plans offer themselves, either of which appears to me desirable to adopt; giving the preference to the first scheme.

1st. I should recommend that the rubble wall which forms the south side of the channel be entirely cleared away, with all eel weirs, and every obstruction to the free current of the water; afterwards, to reduce the ridge of rock which stretches itself quite across the river to three feet in depth, or more if found necessary, from the lowest summer water; this may easily be accomplished in dry seasons, when the water is low, by means of temporary coffer-dams, for the distance of 30 or 40 feet at a time; the water being cleared out of the dams by pumps made suitable for this purpose: the present navigable channel being deepened at the required places by the same method.

The above plan will increase the section of the river considerably, causing the water to flow more freely; and it will be the means of reducing the upper to the lower level, draining a large tract of low land which appears to be always inundated for several months in the wet seasons, destroying the hay crops, &c.

I am rather inclined to this plan, appearing to me, as it does, that it will become a part of the more important arrangements which may be adopted for the general improvement of the river and drainage.

2dly. The second scheme is, by cutting a canal from the head of the fall to a hollow bend at the distance of about a quarter of a mile down the river, to be excavated sufficiently deep at the driest seasons, on a level with Errina Lock upper

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upper sill, allowing for the natural fall of the river; the section of the canal to be of the same dimensions, and to correspond with the other parts already done. To construct a lock near the upper part of the fall, with gates and sluices, thereby keeping the river course as it now stands: at certain seasons this canal may be used without working the gates, as it is apprehended there will be sufficient water to render locking unnecessary.

From Parteen to Cussane Lock, the course of the river and banks presents a very circuitous form, more so than any other part of the line; several of the angles requiring to be taken off and dredged deeper, and some of the hollows filling up, and the towing-path strengthening, and the face of bank protecting with quarry-rubbish and fascines, planting with furze and broom, as before advised for the part near Plasscy.

At Bonown a small river enters the Shannon very obliquely, the mouth of which is protected by wing and retaining walls, extending a considerable distance down into the river, and which are not brought up level with the banks: in the time of floods, this stream brings down with it a considerable quantity of gravel, shingle and other matter, lodging it at its mouth, and causing this part of the river to be very shallow and the current strong; these evils combined render this part very dangerous.

I should therefore recommend this entrance reconstructing, and the stream brought into the river more at right angles, and one or more cascades formed, which would retain any matter brought down, and it could be taken out when the water subsides. The cascade should be made to drop into a deep channel, which would prevent in a great degree the strong current setting in towards the river.

Near Cussane Lock, and opposite Nest Island, the river requires deepening, and a point taken off to increase the width and section; the current setting very strongly at this part, causing a considerable draught for vessels to get round the point; and from thence to near the lock, an embankment requires making to avoid the shallow bay leading into Crow's Corner or Cloonfadda Farm. A sufficient quantity of stone and earth might be taken from the old walls to make the new embankment, and it would render the navigation more perfect, by shortening the distance and improving the line. A new entrance must be formed in this embankment, to discharge a small mountain stream, called the Ballyteague River, which at present enters the bay and forms a very large shoal of fine sand, which chokes up the bay.

Cussane Lock.

This is a double lock; the upper chamber appears sound; the coping requires raking and well jointing with cement.

The lower chamber is in a very bad state, the walls having fallen back out of the perpendicular; and several large cracks appearing, it is to be feared that unless this is immediately attended to, the walls may fall and stop the navigation.

The clapping sills appear to be partly gone, the stones being dislodged; the chamber is also blocked up with rubbish, so that the gates can with difficulty be used, and when shut the leakage is so great that the lock can scarcely be filled or a vessel pass.

The stone sill and fore bay stones are in a bad state; the latter appear to be lifted two inches from their bed by the pressure of the water, and is consequently very leaky, and unless soon repaired bad consequences may follow. The lower chamber is 95 feet 7 inches long, and 16 feet 6 inches broad; the upper chamber is 80 feet 9 inches long, and in breadth 16 feet 6 inches.

The banks on each side of lock require levelling up to the coping.

From this lock to Moy lock, the canal is in a tolerably perfect state.

No. 9.
Report on the Navigation from Limerick to Killaloe.

Soundings from Cussane to Moy Lock.

Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.
	Ft. in.	Ft. in.	Feet.	Ft. in.	Ft. in.	Feet.	Ft. in.	Ft. in.
On Sill	6 0	—	1,300	6 10	—	2,600	7 3	—
50 ft.	8 0	—	1,350	6 10	—	2,650	7 0	—
100	7 6	—	1,400	6 9	—	2,700	7 0	—
150	10 0	—	1,450	6 8	—	2,750	7 0	—
200	10 6	—	1,500	6 9	—	2,800	6 11	—
250	10 0	—	1,550	7 0	—	2,850	6 11	—
300	9 3	—	1,600	6 9	—	2,900	6 10	—
350	8 9	—	1,650	6 9	—	2,950	6 10	—
400	8 0	—	1,700	6 10	—	3,000	6 10	—
450	9 6	—	1,750	6 10	—	3,050	7 0	—
500	9 3	—	1,800	7 0	—	3,100	6 10	—
550	10 3	—	1,850	7 0	—	3,150	6 9	—
600	9 3	—	1,900	7 0	—	3,200	7 0	—
650	8 6	—	1,950	6 10	—	3,250	7 0	—
700	8 6	—	2,000	7 0	—	3,300	7 0	—
750	7 3	—	2,050	7 4	—	3,350	6 9	—
800	8 3	—	2,100	7 3	—	3,400	6 9	—
850	8 0	—	2,150	7 0	—	3,450	6 8	—
900	7 6	—	2,200	7 0	—	3,500	6 6	—
950	7 5	—	2,250	7 0	—	3,550	6 6	—
1,000	7 3	—	2,300	7 0	—	3,600	6 0	—
1,050	7 3	—	2,350	7 0	—	3,650	6 3	—
1,100	7 3	—	2,400	7 1	—	3,700	6 4	—
1,150	7 1	—	2,450	7 0	—	3,750	7 3	—
1,200	7 3	—	2,500	7 0	—	3,783	5 6	on Sill.
1,250	7 0	—	2,550	7 0	—			

The Towing-path requires forming of hard materials, and gravelling.
These Soundings show this portion of the Canal to be sufficiently deep.

Moy Lock.

This lock is 82 feet in length, and 16 feet in breadth; it is built of sound masonry, and is in a good state, excepting the coping and some of the upper courses, which require raking and pointing with cement.

The clapping sills, like all the others, are in a very bad and leaky state; being of stone, this can hardly be prevented.

The gates appear to be in a tolerably sound state; the banks on each side of lock are in a better state than most of the others, but require a little levelling up and gravelling.

Soundings from Moy to Killaloe Lock.

Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.	Distances	Depths.	Required Deepening.
	Ft. in.	Ft. in.	Feet.	Ft. in.	Ft. in.	Feet.	Ft. in.	Ft. in.
On Sill	6 9	—	750	7 0	0 8	1,500	6 6	1 2
50 ft.	7 6	—	800	7 0	0 8	1,550	6 7	1 1
100	8 9	—	850	7 0	0 8	1,600	6 6	1 2
150	8 7	—	900	6 11	0 9	1,650	6 6	1 2
200	8 0	—	950	6 11	0 9	1,700	6 6	1 2
250	7 9	—	1,000	6 8	1 0	1,750	6 7	1 1
300	7 9	—	1,050	7 0	0 8	1,800	6 6	1 2
350	7 9	—	1,100	6 7	1 1	1,850	6 6	1 2
400	8 0	—	1,150	6 9	0 11	1,900	6 9	0 11
450	7 6	0 2	1,200	6 9	0 11	1,950	6 9	0 11
500	7 3	0 5	1,250	6 7	1 1	2 000	6 6	1 2
550	7 0	0 8	1,300	7 0	0 8	2,050	6 9	0 11
600	7 0	0 8	1,350	6 9	0 11	2,100	6 6	1 2
650	7 6	0 2	1,400	6 6	1 2	2,150	6 7	1 1
700	7 0	0 8	1,450	6 6	1 2	2,200	6 6	1 2

(continued)

No. 9.
Report on the Navigation from Limerick to Killaloe.

Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.
Feet.	Ft. in.	Ft. in.	Feet.	Ft. in.	Ft. in.	Feet.	Ft. in.	Ft. in.
2,250	6 6	1 2	3,400	6 6	1 2	4,550	6 0	1 8
2,300	6 6	1 2	3,450	7 0	0 8	4,600	5 9	1 11
2,350	6 4	1 4	3,500	7 0	0 8	4,650	5 9	1 11
2,400	6 3	1 5	3,550	6 9	0 11	4,700	6 6	1 2
2,450	6 3	1 5	3,600	7 0	0 8	4,750	6 6	1 2
2,500	6 2	1 6	3,650	7 0	0 8	4,800	6 6	1 2
2,550	6 3	1 5	3,700	7 0	0 8	4,850	6 3	1 5
2,600	6 6	1 2	3,750	6 9	0 11	4,900	6 3	1 5
2,650	6 0	1 8	3,800	6 6	1 2	4,950	6 0	1 8
2,700	6 0	1 8	3,850	7 0	0 8	5,000	5 9	1 11
2,750	5 9	1 11	3,900	7 0	0 8	5,050	6 9	0 11
2,800	5 9	1 11	3,950	7 0	0 8	5,100	7 6	0 2
2,850	5 6	2 2	4,000	6 9	0 11	5,150	5 9	1 11
2,900	5 5	2 3	4,050	7 0	0 8	5,200	6 9	0 11
2,950	5 5	2 3	4,100	6 3	1 5	5,225	7 6	on Sill.
3,000	5 5	2 3	4,150	6 3	1 5			
3,050	5 4	2 4	4,200	6 3	1 5		105)	118 9
3,100	5 4	2 4	4,250	6 3	1 5			
3,150	5 6	2 2	4,300	6 0	1 8	Average - -		1 2
3,200	5 3	2 5	4,350	6 0	1 8			
3,250	5 4	2 4	4,400	6 6	1 2			
3,300	5 6	2 2	4,450	6 0	1 8			
3,350	5 3	2 5	4,500	6 0	1 8			

From the above soundings it appears that deepening is required to an average depth of 1 ft. 2 in.; hence, 5,225 ft. × 30 ft. × 1 ft. 8 in. = 9,675 cube yards.

The brushwood along the domain of the Bishop of Killaloe requires trimming, so as to clear the water-way; and the towing-path requires gravelling from Moy to

Killaloe Lock.

This lock is 81 feet 6 inches long, and 16 feet 3 inches broad; the masonry is sound, only requiring the joints to be raked and well pointed with cement. Both pairs of gates are in a very dilapidated state, but new ones are about to be fixed.

The banks each side of lock require gravelling.

From Killaloe Lock to the pier-head at the Steam Company's station, where the canal again enters the Shannon, and where the line of the Limerick Canal terminates, the soundings are as follows:

Soundings from Killaloe Lock to the Pier Head.

Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.
	Ft. in.	Ft. in.	Feet.	Ft. in.	Ft. in.	Feet.	Ft. in.	Ft. in.
On Sill	13 6	—	800	11 0	3 0	1,600	8 4	5 8
50 ft.	13 4	0 8	850	11 0	3 0	1,650	11 3	2 9
100	11 6	2 6	900	11 5	2 7	1,700	12 0	2 0
150	11 6	2 6	950	11 0	3 0	1,750	12 3	1 9
200	11 9	2 3	1,000	12 0	2 0	1,800	12 0	2 0
250	11 9	2 3	1,050	11 11	2 1	1,850	12 9	1 3
300	11 9	2 3	1,100	10 1	3 11	1,900	12 9	1 3
350	9 9	4 3	1,150	11 2	2 10	1,950	12 0	2 0
400	12 0	2 0	1,200	9 7	4 5	2,000	11 1	2 11
450	11 7	2 5	1,250	11 9	2 3	2,050	11 4	2 8
500	11 5	2 7	1,300	12 6	1 6			
550	11 3	2 9	1,350	12 4	1 8		42)	106 5
600	11 6	2 6	1,400	11 9	2 3			
650	11 6	2 6	1,450	11 3	2 9	Average - -		2 6
700	11 6	2 6	1,500	10 0	4 0			
750	11 5	2 7	1,550	10 0	4 0			

From these soundings it will be seen that in some parts deepening is required to the extent of 4 feet 5 inches, and upon the whole of this portion an average deepening of 2 feet 6 inches; hence 2,050 ft. × 30 ft. × 3 ft. = 6,833 cube yards.

Soundings

No. 9.
Report on the Navigation from Limerick to Killaloe.

SOUNDINGS of the River, taken at every Chain's Length, about Sixty Feet from the Towing Bank, all the way from Cussane Lock to the Entrance of the Canal to Errina.—3d March 1832.

	Distances.	Depths.		Required Deepening		Distances.	Depths.		Required Deepening		Distances.	Depths.		Required Deepening	
		Ft.	in.	Ft.	in.	Chains.	Ft.	in.	Ft.	in.	Chains.	Ft.	in.	Ft.	in.
	On Sill	9	2	—		59	8	3	1	5	119	20	6	—	
	Chains 1	8	6	1	2	60	12	6	—		120	19	0	—	
	2	7	0	2	8	61	15	0	—		121	14	0	—	
	3	7	0	2	8	62	7	6	2	2	122	9	6	0	2
	4	8	0	1	8	63	8	3	1	5	123	12	0	—	
	5	7	2	2	6	64	9	6	0	2	124	11	6	—	
	6	8	9	0	11	65	10	0	—		125	10	0	—	
	7	8	6	1	2	66	10	6	—		126	10	0	—	
	8	8	0	1	8	67	10	9	—		127	9	0	0	8
	9	9	6	0	2	68	12	0	—		128	17	0	—	
Bay opposite Cloonfadda.	(a)10	7	9	0	11	69	15	0	—		129	16	6	—	
	11	5	6	4	2	70	16	0	—		130	16	0	—	
	12	4	0	5	8	71	18	0	—		(c)131	6	3	3	5
	13	4	9	4	11	72	18	0	—		132	10	0	—	
	14	4	6	5	2	73	16	0	—		133	27	6	—	
	15	4	6	5	2	74	15	0	—		134	27	6	—	
	16	4	0	5	8	75	15	6	—		135	20	0	—	
	17	4	0	5	8	76	16	0	—		136	18	6	—	
	18	4	0	5	8	77	15	6	—		137	19	6	—	
	19	4	0	5	8	78	14	0	—		138	15	0	—	
	20	4	0	5	8	79	16	6	—		139	18	6	—	
	21	4	0	5	8	80	14	6	—		140	21	0	—	
	22	4	0	5	8	81	12	6	—						
	23	5	6	4	2	82	15	0	—		141	21	0	—	
	24	5	0	4	8	83	15	0	—		142	15	6	—	
	25	5	0	4	8	84	14	0	—		143	15	6	—	
	26	5	9	3	11	85	17	0	—		144	15	0	—	
	27	6	3	3	5	86	19	0	—		145	9	6	0	2
	28	6	3	3	5	87	17	6	—		146	10	6	—	
	29	9	0	0	8	88	16	0	—		147	11	6	—	
	30	13	0	—		89	17	0	—		148	13	0	—	
	31	12	6	—		90	19	6	—		149	13	6	—	
	32	10	0	—		91	24	0	—		150	13	6	—	
	33	11	0	—		92	21	0	—		151	15	0	—	
	34	10	3	—		93	20	0	—		152	14	6	—	
	35	10	6	—		94	22	0	—		153	18	6	—	
	36	13	0	—		95	17	6	—		154	19	0	—	
	37	11	6	—		96	18	0	—		155	18	6	—	
						97	18	6	—		156	16	0	—	
Opposite Nest Island.	(b)38	9	6	—		98	16	6	—		157	18	0	—	
	39	13	8	—		99	17	0	—		158	17	0	—	
	40	18	0	—		100	18	6	—		159	15	0	—	
	41	16	0	—		101	20	6	—		160	15	0	—	
	42	7	0	2	8	102	18	6	—		161	17	0	—	
	43	6	0	3	8	103	19	0	—		162	14	0	—	
	44	9	0	0	8	104	19	6	—		163	12	6	—	
	45	9	6	0	2	105	19	0	—		164	14	0	—	
	46	9	3	0	5	106	18	0	—		165	10	0	—	
	47	9	3	0	5	107	17	0	—		166	10	0	—	
	48	9	0	0	8	108	15	6	—		167	9	0	0	8
	49	6	0	3	8	109	14	0	—		168	11	0	—	
	50	7	0	2	8	110	12	0	—		169	10	0	—	
	51	7	0	2	8	111	11	0	—		170	9	0	0	8
	52	12	0	—		112	11	0	—		171	9	6	0	2
	53	15	0	—		113	10	6	—		172	10	0	—	
	54	12	6	—		114	12	0	—		173	10	0	—	
	55	4	6	5	2	115	11	6	—		174	9	0	0	8
	56	5	6	4	2	116	13	0	—		175	9	0	0	8
	57	7	9	1	11	117	16	0	—		176	14	0	—	
	58	7	9	1	11	118	17	0	—		177	18	0	—	

(continued)

(a) Point of Bay opposite Cloonfadda. (b) Lower point of Bay opposite Nest Island.
(c) Bonown Island.

No. 9.
Report on the Navigation from Limerick to Killaloe.

	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.	Distances.	Depths.	Required Deepening.
	Chains.	Ft. in.	Ft. in.	Chains.	Ft. in.	Ft. in.	Chains.	Ft. in.	Ft. in.
	178	15 0	—	242	19 0	—	306	12 0	—
	179	15 0	—	243	5 0	—	307	17 0	—
	180	15 0	—	244	7 0	—	308	13 6	—
	181	14 0	—	245	15 0	—	309	9 0	—
	182	14 0	—	246	11 0	—	310	7 0	1 8
	183	16 0	—	247	5 0	4 8	311	4 0	4 8
	184	17 6	—	248	10 0	—	312	4 0	4 8
	185	14 0	—	249	16 0	—	313	16 6	—
	186	17 0	—	250	14 0	—	314	18 0	—
	187	14 6	—	251	21 0	—	315	15 0	—
	188	14 0	—	252	21 0	—	316	14 0	—
	189	14 0	—	253	22 0	—	317	14 0	—
	190	16 0	—	254	22 0	—	318	6 0	2 8
	191	17 0	—	255	17 0	—	319	6 0	2 8
	192	22 0	—	256	17 0	—	320	8 6	0 2
	193	24 0	—	257	14 0	—	321	13 6	—
	194	24 0	—	258	8 0	1 8	322	14 6	—
	195	22 6	—	259	11 0	—	323	12 0	—
	196	22 6	—	260	10 6	—	324	9 0	—
	197	21 0	—	261	17 0	—	325	8 6	0 2
	198	21 0	—	262	20 0	—	326	12 0	—
	199	20 0	—	263	14 0	—	327	17 0	—
	200	21 0	—	264	10 6	—	328	17 0	—
	201	20 0	—	265	12 0	—	329	15 6	—
	202	20 0	—	266	11 0	—	330	19 0	—
	203	21 6	—	267	14 0	—	331	14 0	—
	204	21 0	—	268	14 0	—	332	12 0	—
	205	21 0	—	(a) 269	3 0	6 8	333	13 0	—
	206	18 6	—	270	8 6	1 2	334	15 0	—
	207	15 0	—	271	9 0	0 8	335	18 0	—
Opposite Church Island.	208	12 0	—	272	13 0	—	336	18 0	—
	209	16 6	—	273	16 0	—	337	16 6	—
	210	17 6	—	274	15 0	—	338	18 0	—
	211	14 0	—	275	16 0	—	339	16 0	—
	212	14 0	—	276	18 0	—	340	15 0	—
	213	12 6	—	277	18 0	—	341	10 0	—
	214	5 0	4 8	278	18 0	—	342	18 0	—
	215	5 0	4 8	279	11 0	—	343	15 0	—
	216	4 0	5 8	(b) 280	2 0	6 8	344	15 6	—
	217	6 6	3 2	281	2 0	6 8	345	17 0	—
	218	6 6	3 2	282	10 0	—	346	16 0	—
	219	10 0	—	283	10 0	—	347	16 0	—
	220	9 6	0 2	284	21 0	—	348	14 0	—
	221	11 6	—	285	25 0	—	349	14 6	—
	222	16 6	—	286	27 0	—	350	14 0	—
	223	20 6	—	287	26 0	—	351	3 6	5 2
	224	22 0	—	288	24 0	—	352	4 6	4 2
	225	23 0	—	289	23 0	—	353	8 0	0 8
	226	21 6	—	290	21 0	—	354	10 6	—
	227	23 0	—	291	18 0	—	355	12 6	—
	228	18 0	—	292	13 0	—	356	15 0	—
	229	11 0	—	293	19 0	—	357	15 0	—
	230	15 0	—	294	22 0	—	358	17 0	—
	231	16 6	—	295	19 0	—	359	19 0	—
	232	12 0	—	296	15 0	—	360	19 0	—
	233	10 6	—	297	15 0	—	361	18 6	—
	234	9 0	—	298	16 0	—	362	18 6	—
	235	19 0	—	299	16 0	—	363	16 0	—
	236	15 0	—	300	20 0	—	364	16 6	—
	237	11 0	—	301	14 0	—	365	16 0	—
	238	12 0	—	302	15 0	—	366	14 0	—
	239	17 0	—	303	15 0	—	367	14 0	—
	240	20 0	—	304	12 0	—	368	14 0	—
	241	19 0	—	305	9 0	—	369	11 0	—

(a) O'Brien's Bridge. (b) Hood & Co.'s Mill.

No. 9.
Report on the Navigation from Limerick to Killaloe.

Distances.	Depths.		Required Deepening.		Distances.	Depths.		Required Deepening.		Distances.	Depths.		Required Deepening.	
Chains.	*Ft.*	*in.*	*Ft.*	*in.*	*Chains*	*Ft.*	*in.*	*Ft.*	*in.*	*Chains.*	*Ft.*	*in*	*Ft.*	*in.*
370	16	0	—		380	12	6	—		390	9	0	—	
371	13	6	—		381	7	0	1	8	391	7	6	—	
372	16	0	—		382	11	0	—		392	8	0	0	8
373	18	0	—		383	11	0	—		393	8	0	0	8
374	16	0	—		384	11	6	—		394	9	0	—	
375	13	0	—		385	7	6	1	2	395	8	0	0	8
376	11	0	—		386	4	6	4	2	396	7	6	1	2
377	10	6	—		387	7	6	1	2		8	2	On Sill at Errina.	
378	10	0	—		388	7	0	1	8					
379	10	0	—		389	9	0	—						

3d March.

On leaving Cussane lock this day for the purpose of sounding the river, the water stood on gauge on the sill of lower gates at nine feet two inches.

The bank upon the southern side of the canal below the lock is at present only six inches above the surface of water; it therefore requires raising about five feet, or nearly equal in height to the north or towing-path side, which would form a protection and prevent the accumulation of silt and other matter depositing in time of freshes in the river.

At the time these soundings were taken, a canal vessel laden to four feet two inches draught of water, grounded at the tail of lock, and in the middle of the canal, which on reference to the Table of Soundings, agrees with this statement. This part requires deepening and widening considerably, and about from 70 to 80 feet taking off the north-west point of towing-path at the commencement of bay, diminishing and terminating at the lock.

At Cloonfadda, near this lock, there is a considerable shallow bay, which makes it very inconvenient for tracking vessels along, obliging them to use a very long line; and when the wind is from the south, assisted by the current of river, drives them ashore, and at times it is very difficult to get off.

A small mountain stream enters the bay, called Ballyteague River, which brings down with it large quantities of clean sharp sand, (suitable for builders,) choking up the passage and rendering it nearly impassable: at the present time, there is only two feet water, and in summer I am informed it is completely dry.

Soundings have been accurately taken, (see p. 59 *et seq.*), and, as I have before stated, the present wall should be taken down and brought further into the river, forming a gentle curve from the lock at Cussane to the lower point opposite Nest Island. From a general inspection, there appears a sufficient quantity of materials in the old wall to make the new embankment and wall as proposed.

Opposite Nest Island the channel is very narrow and shallow, and the current sets strongly round the point; this requires deepening and making wider.

At p. 56 of this Report I have mentioned Bonown, where a mountain stream enters the Shannon; but the water at that time being very high prevented me from seeing and investigating it so well as now.

This stream brings down with it considerable quantities of fine sand and other matter, which has lodged and choked up a great portion of the river; and as it enters in an oblique direction, has carried its matter a considerable way down, rendering the navigation very imperfect and dangerous, and I consider it one of the worst places on this part of the navigation.

The gravel, &c. now washed in should be dredged to the required depth, and the mountain stream turned into the river more at right angles, as previously stated.

Nearly the whole of the accommodation bridges from Errina Canal to Cussane Lock have received considerable injury during the last winter floods, foundations of the wing walls undermined, and coping washed off most of them; also much of the towing-paths and face of embankments have been washed down, heing made of improper materials, and too slight in construction; the water in a great many places overtopping the banks, and for about three weeks the navigation was completely stopped.

This shows the necessity of increasing the area of the channel of the river at Killaloe, *Nest Island, Bonown, Parteen, O'Brien's Bridge, Castle Connell,* and at a little below where the canal enters at Park Lock, removing all the eel

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eel weirs and every obstruction to the free current of the water; this being accomplished would be the means of reducing the head of water to a medium height in times of flood, keeping it within its banks, and thereby draining a vast tract of land now inundated five or six months in the year, destroying the hay crops, &c.; and what is of equal if not greater importance, it would render the canal and river navigation more perfect, less expensive in keeping the towing-paths and banks in repair, and more easily navigated.

As it requires a particular survey and measurement, with sections, &c. and entering more into detail, to explain the different parts already treated of, which cannot be done in a satisfactory manner until the water has subsided to its minimum state, it is impossible for me to give a decided opinion upon some of these points at the present moment. I have however plans, &c. in preparation for this purpose.

Limerick, 7 March 1832. *Thomas Rhodes.*

AS a means of further elucidating some of the circumstances detailed in this Report, I have inserted the following Tables, showing a daily register of the depths of water upon the lock sills connected with the river; which registers are still going on, and will, it is apprehended, be of great service when the reduction of Lough Derg and other important points of improvement upon this great and valuable river have to be treated.

TABLE of the HEIGHTS of WATER on Sills of Locks, &c. from *Limerick* to *Killaloe*; 1831.

—	LIMERICK.				PARK.				ANNAGHBEG.				ERRINA.				CUSSANE				KILLALOE.				Wind
	Morn.		Even.		Morn.		Even.		Morn.		Even.		Morn.		Even.		Morn.		Even.		Morn.		Even.		
Nov.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.	
25	-	-	-	-	13	6	-	-	12	10	12	10	11	10	11	10	-	-	13	5	—		—		—
26	-	-	-	-	-	-	14	6	12	7	12	7	11	11½	11	11½	13	6	13	6	13	6	13	6	—
27	-	-	-	-	-	-	-	-	13	0	13	0	12	0½	12	0½	13	8	13	9	13	7	13	7	—
28	10	3	-	-	13	6	13	7	12	9	12	9	12	0½	12	0½	13	8	13	8	13	7½	13	7½	—
29	-	-	-	-	13	7	13	6	12	8½	12	8½	12	0	12	0	13	8	13	8	13	8	13	8¼	S.
30	10	10	-	-	13	6½	-	-	12	9	12	9	12	1	12	1	13	9	13	9	13	9	13	9¼	S. W.
Dec.																									
1	11	11	-	-	13	6	13	4	12	8	12	8	12	1	12	1	13	9	13	9	13	8½	13	8¼	S.
2	-	-	-	-	13	6	13	3	12	6	12	6	12	1	12	1	13	7	13	7	13	8	13	8	S. E.
3	-	-	-	-	13	3	13	0	12	6½	12	4	11	11	11	11	13	6	13	5	13	6	13	4	S.
4	-	-	-	-	13	2	13	0	12	4	12	4	11	9	11	9	13	4	13	4	13	3½	13	3¼	S.
5	-	-	-	-	13	0	13	0	12	2	12	2	11	9	11	9	13	3	13	2	13	3½	13	2¼	S.
6	12	2	-	-	13	0	13	0	12	3	12	4	11	9	11	9	13	1	13	1	13	3	13	3	S.
7	13	3	-	-	13	3	-	-	12	7	12	7	11	7	11	7	13	0	13	0	13	0	13	0	S. W.
8	12	3	-	-	13	0	13	1	12	2	12	2	11	6½	11	6½	13	0	13	1	13	0	13	1	—
9	12	1	-	-	13	2	13	0	12	4	12	4	11	6½	11	6½	13	1	13	1	13	2	13	2	—
10	11	2	-	-	13	0	13	8	12	2	12	2	11	7	11	7	13	1	13	1	13	3	13	3½	—
11	11	11½	-	-	13	8	14	0	13	0	13	0	11	9	11	9	13	3	13	4	13	4	13	4	—
12	11	3	-	-	13	3	13	8	12	7	13	2	11	10	11	10	13	6	13	6	13	4	13	4	—
13	11	0	-	-	13	9	13	8	13	0	12	7	12	1	12	0	13	7	13	8	13	4½	13	7	—
14	-	-	11	1½	13	7	13	9	12	10	12	10	12	2	12	2	13	10	13	10	13	8	13	9	—
15	-	-	11	3½	13	9	14	0	13	0	13	0	12	3	12	2	13	10	14	0	13	10½	13	10	—
16	-	-	13	1	14	0	14	0	13	3	13	4	12	3½	12	3½	14	0	14	0	13	7	14	0	S. E.
17	-	-	13	4	14	0	14	0	13	2	13	0	12	5	12	5	14	0	14	1	13	11½	13	8	S. E.
18	-	-	14	0	14	0	14	3	12	10	12	10	12	1	12	1	14	0	14	2	13	9	14	0	S. W.
19	-	-	14	0	14	3	14	0	13	6	13	5	12	6½	12	7½	14	3	14	3	14	1	14	1	N. W.
20	-	-	14	0	14	0	14	6	13	4	13	4	12	8½	12	7	14	3	14	4	14	0	14	0½	S.
21	-	-	14	9	14	3	14	9	13	5	13	4	12	9	12	9	14	5	14	5	14	3	14	3	S. W.
22	-	-	14	6	14	0	14	10	13	4	13	10	12	9½	12	9½	14	6	14	6	14	3½	14	3	S. W.
23	-	-	14	6	14	9	14	8	14	0	14	0	13	0	13	0	14	9	14	9	14	5	14	5	N. W.
24	-	-	14	0	14	10	15	8	14	0	14	0	13	3	13	3	14	10	14	11	14	6	14	7	S.
25	13	0	-	-	14	10	15	0	13	9	13	9	13	2	13	2	14	11	15	0	14	5	14	7	S.
26	12	3	-	-	15	8	15	0	14	9	14	9	13	6	13	6	15	2	15	3	14	9	14	9	E.N.E.
27	12	0	-	-	15	2	15	0	14	4	14	4	13	6	13	6	15	3	15	2	14	9	14	9	N. E.
28	12	0	-	-	15	0	14	11	14	3	14	3	13	5	13	5	15	2	15	2	14	9½	14	10	—
29	-	-	12	0	14	11	14	11	14	2	14	0	13	5	13	4	15	3	15	1	14	9	14	8½	—
30	-	-	12	3	14	9	14	8	13	11	13	11	13	3	13	3	15	1	15	1	14	8	14	8	E.
31	-	-	12	3	14	8	14	7	13	9	13	9	13	1	13	0	14	10	14	10	14	7	14	7	S. W.

TABLE of the Heights of Water on Sills of Locks, &c. from *Limerick* to *Killaloe*; 1832.

—	LIMERICK.				PARK.				ANNAGHBEG.				ERRINA				CUSSANE.				KILLALOE.				Wind.
	Morn.		Even.		Morn.		Even.		Morn.		Even.		Morn.		Even.		Morn.		Even.		Morn.		Even.		
	Ft.	In.	Ft.	In.	Ft.	In	Ft	In	Ft.	In	Ft	In.	Ft.	In.	Ft.	In.	Ft	In	Ft.	In.	Ft.	In.	Ft.	In.	
Jan.																									
1	-	-	11	9	14	5	14	4	13	5	13	5	12	11	12	10	14	8	14	7	14	4½	14	4	S. E.
2	-	-	11	0	14	0	14	0	13	4	13	4	12	9	12	9	14	6	14	5	14	3	14	2½	—
3	-	-	11	9	13	11	13	10	13	3	13	3	12	7	12	7	14	3	14	1	14	1	14	0	S.
4	-	-	12	3	13	9	13	8	12	11	12	11	12	4	12	3	13	11	13	11	13	10	13	10	—
5	12	3	-	-	13	6	13	5	12	8	12	8	12	2	12	1	13	9	13	9	13	8	13	7½	S. W.
6	12	0	-	-	13	4	13	3	12	6	12	6	12	0	12	0	13	8	13	7	13	7	13	7	E.
7	11	3	-	-	13	1	13	0	12	6	12	6	11	11	11	11	13	5	13	4	13	6	13	5	S. W.
8	12	0	-	-	13	0	12	11	12	3	12	3	11	8	11	7	13	4	13	3	13	3	13	2	E.
9	-	-	11	6	12	9	12	9	11	11	11	10	11	5	11	5	13	0	13	0	13	0½	13	0½	S. W.
10	-	-	11	0	12	9	12	8	11	11	11	11	11	4	11	2	12	9	12	9	13	0	12	11	—
11	-	-	11	0	12	5	12	5	11	8	11	8	11	1	11	1	12	8	12	7	12	9	12	9	S.E.
12	-	-	11	3	12	5	12	5	11	8	11	8	11	1	11	1	12	8	12	8	12	10½	12	10½	W.
13	-	-	11	3	12	4	12	4	11	9	11	9	11	2	11	2	12	7	12	8	12	10	12	10	S. W.
14	-	-	10	0	12	4	12	3	11	6	11	6	11	0	11	0	12	6	12	6	12	9	12	8	—
15	-	-	10	6	12	3	12	0	11	6	11	6	11	0	11	0	12	5	12	4	12	7½	12	7	—
16	-	-	12	9	12	0	12	1	11	3	11	3	10	11	10	11	12	3	12	3	12	6½	12	6½	—
17	-	-	13	3	12	1	12	0	11	2	11	2	10	9	10	8	12	2	12	1	12	5	12	4	S.
18	13	3	-	-	11	10	11	9	11	0	10	9	10	7	10	7	12	0	12	0	12	3	12	3	—
19	13	3	-	-	11	8	11	7	10	9	10	9	10	6	10	6	11	9	11	9	12	1½	12	1	—
20	13	6	-	-	11	6	11	5	10	9	10	9	10	5	10	5	11	8	11	8	12	0	12	0½	—
21	12	3	-	-	11	4	11	3	10	6	10	6	10	4	10	4	11	7	11	7	12	0½	12	0	—
22	11	6	-	-	11	3	11	3	10	5	10	5	10	3	10	3	11	6	11	5	11	10	11	10	S.W.
23	11	6	-	-	11	1	11	1	10	3	10	3	10	2	10	1	11	3	11	3	11	9½	11	9	S.
24	11	0	-	-	11	0	11	0	9	9	9	9	9	8	9	8	11	0	11	0	11	3	11	3	—
25	-	-	11	0	11	0	10	11	10	0	10	1	9	11	9	10	11	0	11	0	11	4	11	7	—
26	-	-	8	6	10	10	10	10	10	0	10	0	9	10	9	10	11	0	11	3	11	7½	11	9	N.
27	-	-	8	0	10	9	10	9	10	0	10	0	9	9½	9	9½	11	0	11	0	11	8	11	6½	—
28	-	-	8	4	10	6	10	6	9	9	9	9	9	8	9	8	10	9	10	9	11	6	11	5	N. E.
29	-	-	8	4	10	6	10	6	9	9	9	9	9	7½	9	7½	10	8	10	8	11	4½	11	4	N. W.
30	-	-	9	3	10	6	10	5	9	6	9	6	9	7	9	7	10	6	10	6	11	3	11	3	S.
31	-	-	10	4	10	3	10	3	9	6	9	6	9	6	9	6	10	5	10	5	11	2	11	2	S.W.
Feb.																									
1	11	6	-	-	10	3	10	3	9	3	9	3	9	5	9	5	10	3	10	3	11	1	11	1	—
2	14	3	-	-	10	2	10	0	9	3	9	3	9	4	9	4	10	2	10	2	11	1	11	0	S.
3	14	0	-	-	10	1	10	0	9	3	9	3	9	3½	9	3½	10	1	10	0	10	10½	10	10	—
4	13	3	-	-	9	11	9	10	9	0	9	0	9	2	9	2	9	9	9	10	10	9	10	9	S. W.
5	13	0	-	-	9	8	9	7	9	4	9	4	8	10	8	10	10	1	10	1	10	9½	10	10	—
6	12	6	-	-	10	0	10	0	9	3	9	3	9	4	9	4	10	1	10	0	10	11½	10	11½	W.
7	11	3	-	-	10	0	10	0	9	2	9	2	9	2½	9	2½	10	0	10	0	10	11½	10	11	S. W.
8	9	9	-	-	10	0	10	0	9	2	9	2	9	2	9	2	10	0	10	0	10	10	10	10	—
9	8	9	-	-	9	11	9	11	9	2	9	2	9	2	9	2	10	0	10	0	10	10	10	10	—
10	8	7	-	-	9	10	9	10	9	0	9	0	9	1	9	1	10	0	10	0	10	10	10	10	S.
11	8	3	-	-	9	10	9	10	9	0	9	0	9	0¼	9	0½	10	1	10	1	10	10	10	10	E.
12	8	6	-	-	9	10	9	10	9	0	9	0	9	0	9	0	9	9	9	9	10	9	10	9	—
13	10	0	-	-	9	9	9	8	8	9	8	9	8	11	8	11	9	8	9	8	10	9½	10	9½	S. W.
14	12	3	-	-	9	7	9	7	8	9	8	9	8	10	8	10	9	8	9	7	10	8	10	7½	S.
15	12	9	-	-	9	6	9	6	8	6	8	6	8	10	8	10	9	7	9	7	10	7	10	6	S. W.
16	13	3	-	-	9	6	9	6	8	6	8	6	8	10	8	10	9	7	9	7	10	4	10	6	E.
17	12	9	-	-	9	9	9	8	8	6	8	6	8	9	8	9	9	8	9	7	10	5	10	6	S. W.

Thomas Rhodes.

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No 10.
Second Report of Mr. Rhodes on the River Shannon and its Navigation.

SECOND REPORT upon the Means of Improving the *Shannon* Navigation, and of Reducing the Waters of *Lough Derg* from the Winter or Flooded State, to the Ordinary Summer Level.

See Plan 6.

BY an inspection of the accompanying Map and Plan (dated 28 February 1832), which have been made for the purpose of explaining the manner in which it is proposed to regulate the discharge of the Shannon waters at Killaloe, and also to point out the improvement required in the present Limerick Navigation, the course of the Shannon will be seen from Limerick to Killaloe, with the canals which have been formed to avoid the falls and rapids occurring in this portion of the river, the principal falls being at Killaloe (the small fall at Parteen Rapid), Castle Connell and Arthur's Ferry, to the salmon weir at Limerick, the whole fall being about 98 feet.

See Plan 8.

At each of these places obstructions present themselves which prevent the free passage of the water, some of them natural and others artificial: the latter portion consisting principally of eel weirs; partly of the contraction of O'Brien's Bridge, the arches being too small for a free discharge of so large a body of water, and causing, in flooded seasons, a dangerous head; and partly of a wall at Parteen Rapid, constructed for the purpose of facilitating the means of navigation, but which it is submitted has rather increased than diminished the inconvenience, being an additional obstruction to the free passage of the water, and certainly no protection to vessels passing.

It may not be improper to say something in this place upon the construction of eel weirs. They are formed on the bed of the river, as shown in several parts of the Map, and are composed of oak stakes about three inches diameter set vertically in the river, their length varying to suit the irregularities of the bed of the river, and rising to a height somewhat above the surface of the medium water; they are placed at small distances apart, and strongly wattled together with smaller material in the form of hurdles or basket-work from top to bottom; and for the purpose of giving them strength to oppose the currents, large stones and coarse gravel are thrown in against them to the depth of several feet; small openings about four or five feet wide are left at the lower end of the weirs to fix the nets.

At Killaloe these obstructions present themselves in the most formidable manner, and may I think be said to block up the course of the river nearly one half of its entire section. This is an evil which should by all means be removed, though some difficulty may be found in freeing the river from these impediments, as it appears there is in most of them a right of property, and many of them are said to produce considerable rentals.

See Plan 9.

The natural obstructions are, the shoal extending across the river at Killaloe, and the narrowness of the channel a little above Killaloe Bridge; another obstruction occurs in the shoal or ridge at Parteen Rapid. At O'Brien's Bridge there is also a shoal to a partial extent, but not across the river; and at Castle Connell, at the upper part of the fall, the channel is too narrow, which is also the case at Arthur's Ferry.

It will be seen by referring to the Tables of Depths, that the water last winter rose to the height of 15 feet above the upper sill of Killaloe Lock, and as the canal was originally constructed for six feet water (which is quite abundant for the vessels trading thereon) it may hence be inferred that the increase from summer to winter water was nine feet; to prevent this accumulation of nine feet, or nearly to prevent it, is the main object to be obtained, and Killaloe is evidently the point where the attempt must be made.

See Plan 10.

To accomplish this grand object, I propose, at a point near the eel weirs above Killaloe Bridge, as marked on the Plan, to excavate and widen a part of the channel; to construct a stone weir of solid masonry bedded into the rock, of which the bottom is formed, to be 900 feet in length; and to form an elliptical curve, which form appears most suitable for discharging the greatest quantity of water in the least time: this weir to be made of such height as to retain in the driest seasons six feet of water upon the sill of Killaloe Lock. It will also be necessary to regulate the bed of the river, from the intended weir to about 200 yards

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200 yards below the bridge, so as to give this part a regular and even surface, to facilitate the discharge by increasing the velocity; and as the summit of the ridge is at or near this situation, it will be found that this regulation of the river bed will make it requisite to deepen about three feet at the bridge, which there is no doubt can be done with perfect safety, standing as it does upon the rock; and another circumstance in its favour is, that the five principal arches have been rebuilt in a sound and efficient manner: and as a further increase, it will be requisite also to enlarge the four arches at the N. E. end of the bridge into two.

It is submitted that this proposed weir, which will give much more than double the capacity that exists in the present channel, will have the effect of discharging the waters with such an increased facility as will prevent the possibility of a head to any considerable extent ever forming again at Killaloe; as in times of great falls of rain or snow, when much water flows over the weir, the increase of velocity in the bed below it will be such as to take it away freely.

If I am right in the position I have taken upon this subject, it may be safely calculated that not more than a depth of two feet six inches will ever be found to accumulate at the weir at the maximum state, and this it may be seen will be the means of lowering the winter waters six feet six inches, which is abundantly sufficient to keep the waters of Lough Derg and the Shannon at all times within their banks; but if it should be found that the reduction is not adequate to the purposes required, I beg to state that as the N. E. side is composed, of rock, it offers the facility of extending the weir to any required dimensions.

From Killaloe to Cussane the bed of the river requires a little forming and the large stones clearing away, to keep the channel regular. At Nest Island the N. W. channel is shallow and requires to be deepened by means of the dredging engine, as also the island of Ardclooney.

From a second investigation of the Parteen Rapid, taking the necessary soundings, &c., the water being considerably reduced, I have very little to add to my previous Report for obviating this difficult passage, only the water being lower enabled me to judge better of performing the work, which I consider may be done at a very small expense, as nothing requires to be done more than clearing away the eel weirs and the large stones that have been thrown in to secure them; even this may remove the difficulty, but should it not, the walls forming the present channel require to be taken away, and a portion of the ground on the east side, which is coloured red, should be excavated.

At O'Brien's Bridge the Plan exhibits four arches made into two, proposed to be made of cast iron, being light compared with stone, and of which the arches can be constructed with a smaller rise, both to accommodate the height of the roadway above, and for the purpose of forming a towing-path under the side arch for horses: the bed of the river to be deepened, which, with the removal of the two large piers, will increase the waterway, and be the means of adding safety to this dangerous and difficult passage, known best to those that have the charge of navigating vessels through it. Some alterations in the towing-path, &c., which are fully described in the previous Report, are required.

In the alterations at Castle Connell, I propose taking off a portion of the point upon the south side, as also a small bend upon the north side of the river; this portion to be reduced from the upper surface to the level of summer water, with several eel weirs to be cleared away, &c. The formation of a weir or dam at this place, similar to the one at Killaloe, would be the most effectual method. This site is very suitable for the erection of several powerful corn mills, having a good fall of water; and the part of the river above the fall being in nearly a tranquil state, vessels might be navigated close to the weir, bringing and taking away the produce, as may be required, from the mill by the canal. By reducing the head or surplus of water from Castle Connell to Cussane, it would save from inundation a considerable tract of land and bog on both sides of the river, which might be brought into a state of the highest cultivation.

In order to prevent the overflow of water in the neighbourhood of Plassey and Annaghbeg, I find it will be necessary to lower the surface of an island called Illan Arone, near Arthur's Ferry, and take off a point at the south side to the summer level.

No. 10.
Second Report of Mr. Rhodes on the River Shannon and its Navigation.

The works here proposed to be done can be executed without difficulty, and at a comparatively small expense, when their utility is considered; the materials required for the execution of the several works being mostly of native production, and can be obtained in the immediate vicinity.

In prosecuting the examination at Portumna, and from thence to the falls of Meelick, up to which the river is at the same level as at Lough Derg; at this state of the river the greater part of the callows are from nine to fifteen inches above water, and others only level with the surface; therefore, if the proposed reduction is carried into effect, which would be still three feet six inches lower, I consider it would be of the utmost importance, both as regards the navigation of the Shannon, (to facilitate the purposes of commerce,) by keeping the water within its boundaries, and marking out the line of the river, and offering the means of draining the lands upon its banks, (which are inundated upwards of six months in the year,) besides reclaiming vast districts of bog country to the amount of several thousand acres, which without these means cannot be brought into profitable cultivation; it would also afford employment to large and populous districts, which are at present in a state of idleness and want.

From the soundings of the river already taken, it will appear by the Tables now in progress that the sides of the river banks at the greater number of parts are very upright, and at a depth of water varying from 10 to 18 feet deep at the distance of 40 feet horizontal from the verge of the callow land, permitting vessels to come close to the bank. Under these circumstances, and allowing the drainage to be taken still lower, I am of opinion it would not improve the navigation to the extent, nor would it be attended with those beneficial results, set forth in Mr. Grantham's survey, by the land which would be reclaimed under this depth.

It may be argued by some who set their callow land at from 30*s.* to 3*l.* per acre, and probably at even a higher rate, that by the proposed system of drainage it will destroy their crops of grass, which are produced so bountifully by the rich deposit provided by nature during the flooded state of the river, and not requiring the assistance of man. To these I would beg to submit, that (although no agriculturist) by the proposed system of drainage the greater part of the callow land will be rendered arable, and be the means of employing numbers of poor families in agricultural pursuits, now destitute and driven to seek employment elsewhere; and what is of paramount importance, it will be the means of reclaiming far greater and more extensive tracts of bog and low lands, that would be for ever useless without these means be adopted.

Finding, as I do, that a wish is felt for immediate information on the business, I have been actuated by a corresponding anxiety to supply it to the utmost extent of the evidence I have obtained, and therefore I may have gone too far in these observations, when it is considered I have not yet seen the upper part of the Shannon above Meelick during the present state of the waters; and if in proceeding, circumstances should arise to make it necessary for me to reconsider the statement here advanced, yet I feel convinced the principle upon which these conclusions have been formed will be found to be correct.

Thomas Rhodes.

Portumna, 14 April 1832.

— No. 11. —

EXAMINATION and REPORT upon the Bridge on the River *Shannon* at *Portumna*; 14 April 1832.

No. 11.
Mr. Rhodes' Report on the state of Portumna Bridge.

Plan No. 11.

THE River at this place divides itself, forming an island, the centre of which is the division of the counties of Galway and Tipperary, and is the only line of bridge communication between Munster and Connaught, from Banagher to Killaloe, a distance of 37 miles.

This bridge is constructed of timber, and was erected in the year 1796. The Galway part was carried away by a high flood and storm in the year 1814, and was rebuilt and the Tipperary part repaired in 1818, under the superintendence of

No. 11.
Mr. Rhodes' Report on the state of Portumna Bridge.

of Mr. Nimmo. The whole of this structure at the present time is in a state of great dilapidation and neglect, and almost impassable, rendering it dangerous to foot passengers, let alone horses, cattle and wheeled carriages; and its general state reflects no credit on those who have the charge and maintenance of its repairs.

The worst part of the bridge is the Tipperary side, which is 375 feet long, formed by 18 divisions of timber, supported by four oak piles in each row, of various sizes, from 10 to 14 inches square, (being the remains of the first construction); these are connected by a cap, morticed and tenoned at each pile; on which are laid five longitudinal beams or girders 12 in. × 6 in., for the support of the roadway plank, now in a very decayed state. This planking appears originally to have been three inches in thickness, but is now worn through in many places; there are holes in various parts, and they are continually on the increase, which require daily patching, and is done with any kind of material that may be found the most convenient, from three-quarters of an inch to four inches in thickness, and even more, forming a very uneven and dangerous surface to travel upon.

The side rails are fully as bad or even worse than the other parts of the bridge, with few parts remaining of the original form and construction; which from the frequent and almost daily repairs being done by the tollkeeper, or any other unpractised person, forms a ruinous appearance and is quite unsafe.

The bridge on the Galway side is built in form as represented in the Elevation, 391 feet in length, formed by 15 divisions of four piles in each row (or transversely) of Dantzic timber, each pile about 14 inches square.

These piles are connected by a cap at the head, similar to the other bridge, and a diagonal brace on each side. The width of the roadway is 14 feet in the clear, and is constructed of five beams or girders 12 in. × 6 in. of the same timber, and is defended by a trussed side railing, in form as represented. The planking when put down appears to have been three inches in thickness, the whole of which is much worn and decayed.

The height at the centre opening is 17 feet, and at the ends 9 feet 3 inches, (calculating from the present surface of water,) making a rise of nearly eight feet, which is by no means necessary.

Several of the principal piles are broken off and carried away, supposed to have been done by vessels driving against them. The greater part of the piles appear to have been very irregularly driven at the first, which causing a partial strain, has had a great tendency to break them; and having diagonal braces, (without horizontal waling pieces to connect the middle of the piles together,) and these being indifferently fastened, renders the structure loose and disjointed.

The main beams are also much decayed by the water and mud getting in between the joints of the roadway planking, which accelerates the rot: and for want of proper attention in cleaning and scraping the timbers, and coating the main parts with tar, and the lighter parts or handrails with paint, the whole has been allowed to bleach and crack with the weather and heat of the sun, which if attention to these little matters had been bestowed, this structure might have worn out many years longer.

A small bascule bridge, suitable to allow the canal vessels to pass without lowering their masts, (18 feet wide,) was in the first plan erected, but since the introduction of steam vessels on the river this bridge has been enlarged to its present width, (40 feet,) and the same machinery being introduced, which is much too slight, added to which, the centres or axle acting on a rounded piece of soft timber as a fulcrum, and every part being constructed in a rude style of workmanship, makes it a matter of surprise that the whole has not fallen into the river. I believe it is very little used for lifting up, and the less the better for its safety.

Plan No. 11.

The accompanying Drawing represents the elevation of the bridge in its present state, with a transverse section of the frame of each bridge, and section of the bed of the river. I have also introduced a sketch for the rebuilding of this bridge, in case it should be thought necessary; and as the section of the river is more than sufficiently large for discharging the water, I have somewhat reduced it, and increased the masonry and lessened the timber work, which will add strength and durability to the design.

No. 11. Mr. Rhodes' Report on the state of Portumna Bridge.

Instead of the roadway going over an acclivity of eight feet, I propose to carry it quite level at a distance of about 10 feet from the present surface of water, which is quite sufficient for any of the canal boats to go under at any ordinary state of the water.

For the convenient passage of steam vessels or sailing craft, &c., I should recommend a swivel bridge, to be constructed of iron, with substantial stone piers, to be 40 feet in width, to admit of the largest class of vessels that are likely to navigate the Shannon and its lakes; the roadway of which to be carried level with the other parts of the bridge.

Thomas Rhodes.

— No. 12. —

EXTRACT from Mr. *Rhodes*'s Letter, dated 30th April 1832, explaining the proposed Improvements at *Killaloe Bridge.*

No. 12. Mr. Rhodes' proposed Improvements at Killaloe Bridge.

Plan No. 10.

WITH respect to the form and dimensions of the dam at Killaloe, for discharging the superfluous waters of Lough Derg, my calculations were formed from observations, &c. made at various times, by the discharge of the waters through the arches at Killaloe Bridge, by ascertaining the measurement of the arches, the depth of water, and its velocity, during the last winter, which, according to the testimony of some of the oldest inhabitants residing on its banks, say the water was higher than they have seen it for a number of years back.

The sum of the width or span of all the arches at Killaloe Bridge is 403 feet, and the greatest average depth of water observed last winter was about six feet six inches, flowing through the arches with a velocity of seven feet per second; and by an inspection of the Table of the rise and fall of water at the Killaloe Lock gates for December 1831, the water was almost stationary during the period of a month; and the measurement taken at the bridge may be considered as a tolerable good gauge for calculating the extent of the proposed weir.

Therefore by the proposed alteration in the bed of the river, bridge, &c. &c. it appears that the proposed dam would be found amply sufficient.

Callows.

The nature of the land between Limerick and Killaloe is not precisely of the nature of callow, but more of meadow land, the grass of which appears finer, and not of that coarse rank description as those situated very low; consequently it must receive injury by the water remaining so long on it, and the floods coming on so suddenly renders it precarious for gathering in the hay crops.

From various observations I have made along the Shannon and the Brusna, and also from inquiry from a number of persons residing on the banks, they appear to coincide with me, that wherever the water covers the land but partially, or say once in two or three years, the crops of grass are much finer, greater in quantity, and sell much better; and I have no doubt, if the waters were reduced as proposed, after a short time, by allowing the spongy texture of the ground to become a little more consolidated, the callows would become rich meadow, and the upper or more elevated parts might be cultivated and produce rich crops, which would be much more beneficial both to the proprietor and tenant.

There are also tracts of bog above Doonas, Castle Connell and O'Brien's Bridge, which would be materially relieved, and might be brought into cultivation.

From the examination I have been enabled to make for the water, there does not appear much if any natural rock requiring to be taken away to relieve the current, with the exception of a few prominent points, which might be blasted off with a few shots at a light expense; and it is even doubtful whether or not these points are not detached pieces, the whole of which may be removed in summer when the water is low, with little difficulty.

(signed) *Thomas Rhodes.*

Colonel Burgoyne, &c. &c.

II.

LETTER from Colonel Burgoyne to the Hon. E. G. Stanley, with additional Reports from Mr. Rhodes on proposed Improvements of the Rivers *Scariff*, *Rossmore*, and *Ballyshrule*, *Cow Island*, and *Lower Brusna*.

Mr. Rhodes' proposed Improvements on the Rivers Scariff, Rossmore, &c.

Office of Public Works, Dublin,
24 July 1832.

Sir,

I HAVE the honour to forward additional Reports by Thomas Rhodes, Esq. Civil Engineer, the result of the continuation of his investigations on the River Shannon, viz.

No. (1.) Report upon the Scariff. Plan No. 15.

No. (2.) - - the Rossmore. 16.

No (3.) - - the Ballyshrule and Cappagh, small rivers which empty themselves into Lough Derg. 17.

These streams are represented as capable of being adapted, at a very small comparative expense, to form good water communications and receptacles for trading vessels, thus making available the navigation of the deep inlets on the west side of Lough Derg, and introducing more ready means for the shipment of produce from distant parts of the interior.

No. (4.) is a Report upon Cow Island, a point very conveniently situated in the direct line of communication from one end to the other of Lough Derg, and where great facilities exist for the construction of a small pier for trade and refuge. Plan No. 18.

An explanatory Plan for the better understanding of each of these Reports is transmitted.

No. (5.) contains a detailed Report of the Lower Brusna River, from Parsonstown to the Shannon, with plans and estimates showing what might be done to open a perfect navigation for seven miles up to that town. Plan No. 19. 20. 21.

This Survey was made more complete than others, on account of the importance that has been repeatedly attached to this communication; opening a very great extent of fertile country to a much nearer water carriage than it has hitherto possessed.

The Reports advert also to increased power that might be obtained for water-mills, and to the drainage of the lands.

I have the honour to be, Sir,
Your most obedient humble servant,
J. F. Burgoyne.

— No. 13. —

No. 13.
(1.)—Mr. Rhodes' Report on the Scariff River.

Plan No. 15.

(1.)—REPORT upon the *Scariff* River, for the purpose of making it navigable for Canal Vessels.

Scariff Bay lies on the north-west side of Lough Derg, and the northern extremity of the county of Clare; it is fine and open, with a sufficiency of water at all times for vessels navigating thereon, and within a small distance of the shores on each side; but at present does not possess a single pier or landing-place.

The river Scariff enters at the head of the bay, at the distance of about two miles by the course of the river from the towns of Scariff (1,200 inhabitants) and Tomgrany. These towns are admirably situated for receiving and storing grain, and other agricultural productions, from a district of country lying in a westerly direction of eight to twelve miles to Gort, the average breadth of which may be taken at four miles on each side of this line, forming a superficial area of from 70 to 100 square miles, which would make it appear, by making the river navigable, and proper quays erected for facilitating and conveying the produce by boats to Limerick and Dublin, would benefit this part of the country, and particularly as there has been a new line of road lately made from Gort to Scariff.

The entrance of the river from the bay is partially shallow for a short distance, and in a few places only three feet water; the bottom is at this part of a soft marl or alluvial deposit brought down by the river.

From its entrance to the first mile the river is quite capacious, being in width varying from 90 to 30 feet, and sufficiently deep for canal vessels, which will appear by the soundings (*see* p. 71) taken at every chain's length (22 yards), datum 8 feet 6 inches on the upper sill of Killaloe Lock; beyond this point to the landing-place of the Steam Navigation Company, leading to Tomgrany (three furlongs), it is partially shallow and the bottom uneven, with large stones, detached pieces of rock, and in all probability some part in a solid state, and in some places only two feet deep of water. From this to the island the water is tolerably deep, bottom uneven, with rough stones and gravel; opposite the island it is partially shallow, the surface of the water may be considered level with Lough Derg, and from this point to the bridge at Scariff the rise is four feet over a rocky bottom.

To make the river navigable and safe at all times for canal vessels, which it appears should be to the upper end of the island near Scariff bridge, two schemes offer themselves; viz.

1st. To deepen the river at the entrance of the bay with a dredging machine, or by men with the bag and spoon; several of the sharp bends in the first mile will also require a little sloping off, and a towing-path forming on the south side, the whole length of the line, with culverts at the several land drains.

For deepening and clearing the bed of the river from stones, &c., I am of opinion, the best and cheapest way for performing this operation is by means of the diving machine, which might be constructed in a temporary manner of timber, in the form of a square box, six feet six inches long, four feet six inches wide, and about four feet six inches high, made air tight by caulking the joints; it would be necessary to have five or six lenses or deck glasses at the top to admit light, also a small air pump to force in the air during the time of working. The whole apparatus might be suspended from a lighter or barge, and two men to work inside for attaching the ropes or chains round the largest of the stones and the smaller ones into buckets, the whole extent requiring to be deepened might be done at a small expense. The part opposite the island, a dam might be formed across each end, and the river turned down the north channel, during the performance of deepening.

The fall from the surface of water at the bridge to the river below at the island is four feet, and two feet may be added for the fall above, which would clear

No. 13.
(1.)—Mr. Rhodes' Report on the Scariff River.

clear the tail-water of the mill above the bridge, making the total fall six feet, which appears a desirable situation for a corn-mill (C); by making the river navigable to this point it affords great facilities for constructing a quay, granaries, &c. and for taking away the produce of the mill; viz. flour, meal, &c.

A quay or landing-place at Tomgrany (B) is much wanted, the present being next to useless; and the road requires considerable repairs: materials of the finest description being close at hand, and suitable for these purposes.

2d. The second Plan is by erecting a lock at (A) with a weir, &c. and damming up the water above this to the height of three feet, the banks on each side being nearly of sufficient height to retain this head of water; but to make the sides of the channel more regular, a little might to be taken off each to form the side embankments.

I propose the form of the lock and weir to be similar to that proposed for the Brusna river. The bed of the river being of a rocky description, and material of the finest quality for building, the expense would not be great; it would also give a fine depth of water to Scariff bridge.

Of the two methods, I am rather inclined to give the preference to the first, being, as I consider, less expensive. The lands and callows on each side of the river and bay are situated low, and inundated periodically, the grass of which is of a fine description, being so near the Limestone Rock. A reduction of the waters of Lough Derg would relieve them much, and be beneficial to the country; it would also improve the navigable part of the river, as its course cannot be discovered during the winter time, by the banks being overflowed.

At the upper end of the bay and entrance of the river large quantities of excellent marl for agricultural purposes can be obtained with little labour.

Shannon Harbour,
14 June 1832.

Thomas Rhodes.

SOUNDINGS of the Scariff River, begining at (a) about 10 chains below the entrance, to the Island below Scariff Bridge.

(Datum eight feet six inches on the Upper Sill of Killaloe Lock.)

Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
10	6	9	3	15	0	8	3	8	6	5	9	5	6	6	6	5	3
10	0	10	0	16	6	14	0	9	3	5	9	5	0	(c)6	9	4	9
10	0	12	0	16	6	12	0	10	0	6	0	4	6	7	0	4	6
9	9	12	0	16	0	12	0	11	6	6	6	5	6	7	0	3	9
9	0	12	0	8	0	11	0	18	0	6	9	7	0	7	9	3	9
6	6	12	0	7	6	11	0	12	6	6	9	(b)3	9	6	6	3	0
4	9	12	0	8	9	13	0	12	0	8	0	5	0	6	0	4	9
4	0	12	0	8	6	14	0	9	0	11	0	3	0	7	3	4	9
8	9	25	0	13	0	12	0	7	0	9	0	2	9	6	3	5	0
(a)12	0	18	0	19	0	12	0	7	3	8	0	4	0	6	3	5	9
7	9	8	0	20	0	12	0	6	0	6	0	5	6	6	6	(d)4	6
12	0	8	0	10	0	12	0	5	0	4	3	7	3	5	3	2	6
11	6	7	0	8	0	10	0	5	0	2	0	7	6	5	9		
10	3	11	0	6	6	8	0	6	0	4	3	6	6	5	0		
10	0	13	0	6	6	9	9	6	3	7	6	8	3	4	6		
9	6	14	0	8	3	8	3	6	3	6	0	9	3	4	6		

(a) At entrance of River
(b) Large stones and detached pieces of rock.
(c) Present Quay.
(d) Branch on right round the Island.

—No. 14.—

(2).—REPORT upon the *Rossmore* River.

No. 14.
(2.)—Report of Mr. Rhodes on Rossmore River.

Plan No. 16.

Rossmore River is on the N.W. side of Lough Derg, and about seven miles from Portumna, entering at a small bay north of Cooess Bay. There is fine deep water, and the general soundings are from three to four fathoms until entering at the mouth of the river, which at the present time is only two feet nine inches depth of water, caused by the formation of a shoal which extends quite across the channel; it its composed of marl and mud, washed down by the floods, but its extent is not very great. From this part to the distance of 1 ½ mile the water is almost sufficiently deep for canal vessels, with the exception of a few shoals formed of fine sand, and at the upper end a number of large stones and detached pieces of rock.

The river is very circuitous, running through low callows, bog and meadow lands, and its width varies from 60 to 34 feet in the present navigable parts. The callows are about 1 foot 6 inches, bog 12 feet, and the meadow lands from 2 feet 6 inches to 5 feet above the surface of the water; and a large tract of country on each side up to Rossmore bridge is inundated during the winter floods, to which point the river is nearly navigable where it gets narrow and shallow. There is a rise of about 10 feet which occurs at this point and presents a good situation for a mill, as there is abundance of water if properly husbanded; but this fall seems to mark out the termination of this navigable communication towards Woodford, and by the formation of a good road, may answer for all purposes at present.

From Rossmore bridge to Woodford by the road is rather more than two miles. This road is in a very bad state of repair, and almost impassable for loaded carts, and if it be so in fine weather what must it be in the wet seasons and winter, when most wanted for taking away the corn to be shipped off by vessels; facilities of this description are very much neglected in this part of the country, and which is baneful to all improvements.

To make the lower portion of the river navigable at all seasons, some of the sharp bends require easing a little, the sides sloping to an angle of 1 ½ to 1 feet; and making nearly an uniform width, the excavation taken from the sides may form embankments on each side.

The shoals will also require dredging to six feet below the surface of the summer water, which will give sufficient area for discharging the winter floods, and as the shoals are principally marl, and being in great abundance at the mouth of the river, the expense would be repaid by disposing of it to the farmers, as it forms an excellent manure for reclaiming the bog, &c. &c.

The detached pieces of rock and large stones might be taken up at a small expense, which would form a quay wall or landing-place, with stores, &c. (at A) near Rossmore bridge, and a short piece of road would require forming and making to join the main line of road to Woodford; by a better formation of this line, erecting one or two small bridges now tumbled down, and putting the whole line into a through repair, it would afford a good line of communication from Woodford to the Shannon, this with a new line of road now under projection from Scariff to Portumna, intersecting at this landing-place would be the means of benefiting a great district of country in the easy conveyance of its agricultural produce, also of lime, manure, &c. for the better cultivation of the soil, as there are hundreds of acres of good high or upland now lying in a dormant state.

There is also a very fine freestone rock, situated on the top of the Ben mountain, 1 ½ mile west from Woodford, which from its delicate colour and compactness might be found of great value, as blocks of any magnitude can be produced, suitable for columns, fronts of public buildings, mansions, and other architectural purposes; and as the conveyance would be all down hill to the river, it might be carried at a comparatively little expense.

Shannon Harbour, 14 June 1832. *Thos. Rhodes.*

No. 14

(2.)—Report of Mr. Rhodes on Rossmore River.

SOUNDINGS of the Rossmore River, beginning about 15 chains below the Entrance of the River.

(Datum 8 ft. 5 in. on the Upper Sill of Killaloe Lock.)

Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
7	9	4	0	13	0	7	0	5	0	5	6	8	0	4	6	6	0
7	0	4	0	10	9	7	3	7	0	5	0	6	6	4	3	5	3
7	2	4	0	11	0	8	0	6	0	5	3	9	0	(b) 3	3	6	3
7	0	3	6	11	6	6	9	5	3	5	0	9	3	(b) 3	6	4	3
6	9	3	3	8	0	6	0	5	0	5	0	6	9	3	6	6	6
6	6	2	9	9	6	6	0	5	3	6	6	5	0	8	3	3	0
5	9	2	9	11	9	6	9	5	0	4	3	5	3	8	0	4	3
5	9	3	0	15	0	6	6	7	0	6	3	4	6	3	0	(c) 3	3
5	9	3	6	7	0	6	0	5	3	7	0	3	9	4	6	(c) 3	3
4	6	3	9	9	0	5	0	6	6	6	3	3	9	5	9	(c) 3	6
4	9	4	0	8	9	5	3	8	9	6	9	4	0	8	0	(c) 5	0
4	9	4	3	9	3	5	3	6	9	8	6	5	9	3	6	7	9
4	6	4	9	10	0	5	3	6	0	8	9	4	0	3	9		
4	3	4	6	10	0	7	3	4	9	7	9	3	3	3	3		
4	0	5	6	13	0	4	9	6	6	8	0	3	0	6	0		
4	0	(a) 3	6	6	0	4	9	5	0	8	6	2	9	4	3		
4	0	9	6	8	0	5	0	5	6	7	9	3	6	5	0		

(a) At entrance of the river. (b) Narrow passage. (c) Large loose stones.

—No. 15.—

(3.)—REPORT upon the *Ballyshrule* and *Cappagh* Rivers.

No. 15.

(3.)—Mr. Rhodes' Report on Ballyshrule and Cappagh Rivers.

THE Ballyshrule River enters at the head of the fine deep bay of Cloongagauve, on the north-west side of Lough Derg. The entrance is rather shallow, having only four feet depth of water (*see* Soundings); its width at the mouth is about 130 feet, diminishing to 90 feet, and it retains this width for the distance of three-quarters of a mile; from this point to the distance of 10 chains, it is contracted to about 13 feet in breadth, choked up with large stones from half a ton to 1½ ton weight (of the limestone kind); from this contracted part to Kelly's Mill, it assumes a fine wide canal, (about 40 feet,) and of a sufficient depth of water, with the exception of three shoals (of gravel and stones,) of small extent.

See Plan No. 17.

From Lough Derg to Kelly's Mill, the distance is two miles, where the partially navigable part of the river terminates; beyond this point, it is quite narrow and shallow, producing but a small stream in dry weather. In this distance it is on the same level as Lough Derg.

The whole of the shallows might be deepened, and the narrow parts widened, and the river made navigable for a few hundred pounds, which would be of considerable benefit to the occupier of the mill, (Mr. Lynch,) who ships off great quantities of corn, flour and meal to the Limerick and Dublin markets, which at the present time he has to convey overland to the Shannon at Portumna, a distance of nearly five statute miles, the greater part of which expense would be saved by forming this navigation. It would also afford a good site for grain stores, general traders, &c., being situated five miles nearer Loughrea and the adjoining country than Portumna, which would effect a great saving in distance.

The present effective head of water at Kelly's Mill is only three feet nine inches; but by lowering the waters of Lough Derg as proposed, it would increase the fall upwards of nine feet, and afford a great addition to the power.

It will be seen by an inspection of the Plan, that the River Cappagh branches off from from the Ballyshrule in a south-westerly direction, and I found by exploring it to Cappagh Bridge, that it is of greater importance, both as to the depth of water and width, also from a greater quantity of water flowing down, and better as a mill-stream, and would form a nearer line of communication along the valley towards Loughrea, the distance from the bridge being only

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(3)—Mr. Rhodes' Report on Ballyshrule and Cappagh Rivers.

about eight statute miles. By rendering this branch navigable to Cappagh Bridge, and forming a good line of road to the interior of the country, it would be of great benefit in improving the line of intercourse, shortening the distance to Dublin, instead of going by the way of Ballinasloe; it would also shorten the distance, and open the market by an easy conveyance to Limerick, which it is submitted would be much cheaper than to Dublin, the dues being so high on the Grand Canal.

By carrying the levels from the surface of the Shannon in its present state to Cappagh Bridge, I found the rise to be five feet two inches. By erecting a lock and mill-dam (C) about a mile from the Shannon, it could be made navigable, by clearing the bed a little, and correcting a few of the bends to the bridge, which by the addition of three feet would make the head eight feet; producing an excellent stream for a powerful mill, and which would repay a part of this erection.

Taking advantage of the falls of water in the different parts of the country, for the purposes of grinding corn, &c., as they are much wanted, I conceive would form a considerable source of wealth; as by taking the produce to market in a manufactured state, viz. flour, oatmeal and barley, the first finding always a ready market, and the two latter being the principal growth, and for which there is a great demand in Scotland and the manufacturing districts in the north of England, it would be the means of getting a higher market price and for giving employment to the mechanical and labouring classes of this country in the different departments, and also turning the elements into beneficial and useful purposes.

The bogs in this district are extensive, occupying a space of several thousand acres, uncultivated barren wastes; and as I thought it might not be foreign to this duty, I took the levels of one of them, lying north of the river, belonging to the Marquis Clanricarde; it is about three-quarters of a mile across, north and south, and a mile in length, east and west, the section of which is on the Plan, and was taken from (A) to (B); it is elevated 21 feet above the present surface of Lough Derg, and its base on the south side verging on the lake; and although there has been a continuance of fine dry weather, the surface of the bog is quite soft and completely saturated and surcharged with water, which being of the nature of sponge, holds the water in suspension as it were by capillary attraction. Therefore, until the waters of the Shannon are reduced, I am of opinion they cannot be beneficially reclaimed, though they otherwise might be brought into good cultivation, and in a few years form lands equal to any in the neighbourhood, having the advantage of good marl, lime, sand and gravel quite at hand, in great abundance and suitable for these purposes. It would also afford means of support and employment to thousands of poor people now willing to work, but under the necessity of emigrating to distant parts in search of employment and sustenance, when by opening these latent sources, plenty is at hand (by proper management).

See Plan No. 17.

I have shown by the black lines the proposed mode which I should recommend for draining; each line would form the division or allotment to the different tenants, which might be from 30 to 40 or 50 acres in area each, or according to the discretion of the landlord. The main drains might be sunk by degrees, say two feet at a time, and small lateral drains to facilitate the operation to allow the water to escape, and for the bog to compress gradually: at each of the main drains a fence might be planted, and roads formed in various directions for the use of the occupiers carrying their manure, &c. Some of these drains might be filled up after the bog has become sufficiently drained, as the main lines will then be sufficient.

See Plan No. 15.
16.
17.

On each of the Plans of the Scariff, Rossmore, Ballyshrule and Cappagh Rivers, are shown the line of inundation on the lands during the winter floods, of which the space is very extensive, and until the water is reduced, must be both detrimental to their cultivation and also the navigation, and to the general improvement of this part of the country.

As a considerable step to the improving of this part of the country, good lines of road communication to the different towns and shipping places are much wanted, and it would be well if a better system was adopted in their formation, (differing from the old plan,) with a proper selection of the materials to be used; attention to these important matters are much neglected, and from the observations of the new lines of road near Scariff, and several other parts, I am inclined

to

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to think that good lines are often destroyed by the contact of petty trifling interests, which ought at all times to be avoided, for the general good.

At the south point of Cloongagauve Bay, (near the castle,) there is a very fine limestone rock, which might be converted to valuable purposes by supplying the farmers of the surrounding country with good lime, fuel (turf) being quite at hand, might be afforded at a cheap rate.

Thos. Rhodes.

Shannon Harbour, 14 June 1832.

SOUNDINGS of the Ballyshrule River, beginning about 15 chains below the Entrance to Kelly's Mill.

(Datum 8 ft. 4½ in. on the Upper Sill of Killaloe Lock.)

Ft.	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*	*Ft.*	*in.*
8	0	4	0	19	0	21	0	17	0	11	0	4	3	7	9	8	6
7	6	4	3	19	0	21	0	17	6	11	0	7	6	5	0	9	0
7	6	4	0	19	0	21	0	17	6	7	6	2	6	6	6	6	6
7	6	5	6	19	0	21	0	16	0	[b]7	0	2	6	7	3	8	0
7	6	8	0	19	0	23	0	17	0	4	9	5	0	5	6	8	2
7	3	9	0	21	0	24	0	18	6	4	9	5	0	4	6	5	6
7	3	10	0	20	0	23	6	18	0	4	6	4	3	6	3	1	3
6	9	11	0	21	0	21	0	20	0	4	6	6	6	3	3	8	3
6	9	[a]18	0	22	0	21	0	20	0	5	0	6	0	2	6	7	9
6	0	20	0	21	0	21	0	19	0	2	0	4	3	1	0	9	3
6	0	23	0	21	0	24	0	16	0	2	0	9	3	4	6	6	3
5	6	22	0	21	0	26	0	16	0	6	3	9	9	6	6	4	3
5	0	22	0	22	0	25	0	15	6	6	3	8	6	9	0	8	9
4	9	23	0	22	0	16	0	12	0	[c]1	9	1	0	10	0	7	6
4	6	23	0	23	0	13	0	18	0	3	0	4	0	7	0	5	3
4	6	21	0	21	0	19	0	12	6	4	3	4	6	7	0	6	6
4	9	19	6	20	0	22	0	12	0	4	6	6	6	7	3	6	9
4	0	19	0	23	0	22	0	15	6	4	0	7	0	6	0	2	3
5	0	18	6	21	0	19	0	16	0	3	6	5	9	2	0	[d]2	0
4	9																

[a] At entrance to river.
[b] Bottom of the island.
[c] Top of the island.
[d] Kelly's Mill.

— No. 16. —

(4.)—REPORT for making a Landing Pier and Harbour at *Cow Island*, on *Lough Derg*.

No. 16.
(4.)—Report of Mr. Rhodes on Improvements at Cow Island.

Plan No. 18.

Cow ISLAND is situated on the west side of Lough Derg, at about half way between Killaloe and Portumna, and nearly opposite Dromineer Bay.

It is divided by a narrow shallow channel about 230 feet from the main land, and nearly three feet above the ordinary flood water; its length may be taken at 200 feet, and breadth 60 feet, composed chiefly of detached pieces of rock, and a part in a solid state, with a great number of large tumbling stones lying round the base for a considerable distance out, and along the sides of the shore, rendering it dangerous for laden vessels approaching within 300 feet during the summer season.

The situation appears well adapted for constructing a small harbour for vessels taking shelter in stormy weather, and for landing and taking in their cargoes of grain, and other agricultural productions, as it would command a considerable circuit of country round this point. It would also form a good station for the steam packets embarking passengers, luggage, &c. to Limerick or Dublin, being within a mile of the main line of road from Ennis, Gort, Scariff, Woodford and Loughrea, and there is a road begun (although at present suspended), to connect it immediately with this line. The surrounding country being very populous, the erection of a pier, and making a good road to it, and improving or making a new line of road from Scariff to Portumna, would be a very great benefit to this part of the country, the present line being very badly laid out, and not kept in proper repair.

A temporary

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(4.)—Report of Mr. Rhodes on Improvements at Cow Island.

A temporary pier is now forming for this purpose towards the island, and is at present extended about 120 feet in length, 26 feet wide, and about 5 feet in height; but I am not aware as to the extent or form in which it is to be finished.

Plan No. 18.

The accompanying sketch shows the situation of the island, together with the pier and new road (which I am informed) is now being made by the Steam Navigation Company, with the land belonging to the same concern, which they have taken for the purpose of building an inn for the reception of travellers, and also for the erection of stores and other conveniences for receiving the produce of the country.

I have also given a sketch or design for a harbour, pier or landing-place, which I consider would answer extremely well. It might be constructed from the rough stones lying round the base of the island, a great quantity of which is nearly left dry by the water, and can be rolled to their places with ease; the remaining part may be taken up from under water by a lighter, shears and suitable tackle fitted up for the purpose. This would do away with the necessity of quarrying any of the material for this construction, and would be performed at a much cheaper rate; it would at the same time improve the depth of water alongside the pier head and harbour, so that vessels might approach with safety.

A store erected upon the pier head, with a small crane or two, would answer better than at a distance, as it would afford a shelter to the vessels inside, and greater despatch, with less expense, would be necessary for shipping their cargoes.

The inside of the dock would require excavating to the depth of six feet at low water, to admit steamers, &c. in tempestuous weather. In building the walls, the style of workmanship does not require to be of a fine description, rough hammer-dressed materials, set in good mortar, is all that is necessary; and as good limestone and sand is in great abundance on the spot, the work might be done very cheap, the greater part being for labour only.

The top of the walls would require a substantial coping, secured with dowels, &c. with a sufficient number of mooring stones. The dimensions marked on the Plan are quite arbitrary, and may be altered to any size found best to answer the views of those interested.

Thos. Rhodes.

Shannon Harbour, 14 June 1832.

— No. 17. —

(5.)—REPORT upon the *Lower Brusna* River, for the purpose of making it Navigable from the *Shannon* to *Croghan* Bridge near *Parsonstown*.

No. 17.
(5.)—Report of Mr. Rhodes on the Lower Brusna River.

Plan No. 19.
20.

Parsonstown is pleasantly situated, well built, and contains a number of wealthy and respectable inhabitants; the population is about 7,000 persons, chiefly engaged in agricultural pursuits, and at several extensive distilleries; it is the focus of an extensive and rich fertile country, from whence great quantities of corn, flour, spirits and butter, besides fat cattle, sheep and pigs, are exported annually; and from the population the imports must be considerable in timber and iron for building, also hardware, woollens, linens, groceries, coal, coke, &c. and other articles of commerce; but having no vent or facility for taking away its produce, except by cars to Portumna (12 miles), Banagher (8 miles), Shannon Harbour (9 miles), and Tullamore (20 miles), the expense of which must be very great compared to water carriage, it would appear that a navigable intercourse should be obtained to enable the merchant and trader in the interior to forward their goods to market at a reasonable rate, to compete with those situated near the great lines of water communication leading to the different shipping ports, for which desirable object the river Brusna presents itself, being the most eligible line for forming a communication and connection with the ports of Dublin and Limerick.

The

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(5)—Report of Mr. Rhodes on the Lower Brusna River.

The accompanying map, which is made from an actual survey, shows the course of the Brusna, from its junction with the Shannon at the entrance of the Cloonaheenogue Canal to Parsonstown.

The whole of its course is very circuitous, narrow and winding, interrupted by a number of shoals, eel weirs, and mill dams.

On both sides of the banks, from the Shannon to New Bridge are extensive callows and meadow lands, (which are completely inundated during the periodical overflow of the Shannon) and are bounded by the bogs of Redwood, Castle Cloghan, Courlass, &c. which might easily be reclaimed by a reduction of the waters, and a proper system of drainage. The callows are at present about eighteen inches, and the meadows about five feet from the surface of the Brusna (datum six feet nine inches on the lower sill of Hamilton's Lock).

The surface of the ground from New Bridge to Melville Mill and to Parsonstown rises gradually, passing through and into a fine agricultural country, and the whole may be said to form one uniform inclination from two miles upwards from its junction with the Shannon to Parsonstown.

For the distance of two miles from the Shannon, the Brusna is navigable for the largest class of canal vessels (with the exception of one shoal which may be taken away at a small expense); in this distance, according to the soundings (*see* Table, p. 80,) taken at every chain, the depth varies from 10 to 22 feet, (datum six feet nine inches on Hamilton's Lock,) and the surface may be considered even with the Shannon. Its width in this distance varies from 60 to 140 feet.

From this point to New Bridge the channel is contracted and partially shallow, particularly at the bendings, where the sand and other matter brought down by the floods lodges, choking up the passage and preventing the water from flowing in its natural course, causing the low lands or callows on both sides to be inundated; and as this occurs frequently in the summer and autumn seasons, it destroys the hay crops, also, what is equally bad, it deposits the silicious matter in the hay and grass, rendering it useless and destructive to the cattle (by the disease called murrain.)

The rise of the water's surface at New Bridge above the Shannon is two feet nine inches, and as the Shannon is much lower in summer than when these soundings and levels were taken, three feet may be safely added, making the rise five feet nine inches.

At New Bridge a wier is formed for the protection of the foundation of the bridge, with a rise of three feet one inch. From this part to the tail-race of Melville Mill the water is almost sufficiently deep, but the course is narrow and winding: the banks are from three to six feet above the water's surface.

From the shallow below the mill-race to the dam head, the rise is 15 ft. 3½ in. The river in this distance is very shallow, varying from seven inches to two feet in depth.

From Melville mill-dam head to Croghan bridge, the river is in a number of places to the required depth, and nearly reduced to a tranquil state by the formation of salmon and eel weirs, the rises of which are 2.83, 1.33, 0.39, together forming a rise of four feet six inches and a half. The minor falls and the natural current of the river two feet eight inches and a half, making the total rise from the Shannon to Croghan bridge 28.40 feet (or nearly 28 ft. 6 in.) and at the summer level of the Shannon 31 ft. 6 in.

The distance from the Cloonaheenogue Canal to Croghan bridge, along the course of the river in its present state, is 9¼ statute miles, but making the necessary improvements would reduce it to 8¾ miles, and by the line of the canal, as shown on the Map, being a more direct course, is about eight miles.

By comparing the two lines and distances, the ground on both sides of the river, the expense of making and maintaing each, I am of opinion that by making a portion of it a canal communication, *i. e.* from the two miles to Melville Mill, is preferable, being much less expensive, to making the whole of the river navigable. But on the other hand, taking the drainage of the lands and reclaiming the bogs into consideration, which must greatly improve the country in the cultivation of the soil, and add salubrity to the climate, it appears absolutely necessary to alter and enlarge the course of the river, which enlargement is nearly equal to making the canal. Taking this view of the matter, it would appear desirable to make the river navigable the whole of the way, which would serve two purposes, and as both schemes are equally practicable, it must rest in a great measure

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measure with the proprietors of the soil and the parties interested which course to adopt.

For this purpose I have delineated on the map the proposed line of the canal, and also the improvements required on the river, and have formed estimates of the expense of each, which will enable you to judge of their comparative utility.

The line of the canal is drawn upon the south side of the river, that appearing more eligible and less expensive; but if it would better answer the views of the proprietors, there is no reason why it should not be on the north side.

At a little above New Bridge, there are at present two old mills at work, viz. Bonaraven upon the north, and Melville on the south side; but these mills, although their situation is excellent, and their available power all that could be desired, are very disadvantageously placed and very inefficient in their construction, consequently cannot do one quarter the work they would be capable of under a judicious arrangement. The proposed works would not diminish, but rather enhance the capabilities of these mills.

By a proper distribution of the falls, excellent sites for three powerful mills can be obtained, viz. at New Bridge, Melville, and at or near Dovegrove, which would be of considerable value, and in an agricultural country like this, are much wanted, and would form a source of great wealth, as there appears a *sufficiency of water* at all seasons for driving machinery of any description. On the detailed Plan or Sketch, I have endeavoured to show how this can be applied to advantage.

For the purpose of making the river navigable, adapted to all classes of vessels trading upon the different parts of the river, viz. the Limerick Navigation, Grand and Royal Canals, I propose taking off the principal bends or quick turns of the river, as marked upon the Map by the red lines, making an embankment on each side, and forming a towing-path the entire length. See Plan No. 19.

What is taken off from the prominent parts and bottom, may form the embankment on each side, (as shown in the section,) also fill up the hollows on the opposite sides, so as to make the channel a more regular line and nearly one uniform breadth, rather diminishing upwards, to construct locks at the several parts required, removing the rapids, causing the current to flow with an equable velocity, and to enable vessels to navigate at all times (excepting severe frosts). For the formation of the new channel, the inside slopes should be formed at an angle of 1½ horizontal to 1 perpendicular, to the height of six feet from the level of the sills; the bottom of the river course not to be less in breadth than 40 feet, and at the surface 58 feet: to have a bench on each side of six feet, and the bank to be raised three feet, with a slope of two to one, which will give the river-course additional area in time of flood, and protect the lower part of the bench and slopes: the upper bank or towing-path to be 15 feet wide and gravelled on the top, with a catchwater drain, and planted with quicksets to form a fence; the opposite one to be the same, when there is earth to make it of equal dimensions: the outside slopes to be formed at the same angle, or made more horizontal when a sufficiency of material will allow, which may be planted, and side drains formed at the bottom of these slopes for conducting the water from the surface of the adjacent country, forming a ready passage to the outfalls or locks.—(*see* cross section).

For the protection of the new made banks, or filling up the hollow parts, a facing of gravel or some heavy material laid upon the face about six inches thick, would prevent the light earth from washing away, and would cause it to consolidate the sooner.

In the division of the locks, I propose the first at the third mile of 6½ feet rise; second at New Bridge of 7 feet 6 inches rise; third at Melville Mill of 11 feet rise, and the fourth at Dovegrove of 6 feet 4½ inches rise; each of the locks to be at least 80 feet in length by 16 feet wide; the whole built of well squared masonry backed with rubble work, *the whole* set in good water cement, fitted up with timber gates and sluices, and should it be the intention for steam vessels to ply, it would be advisable that the locks should be of larger dimensions.

At each of the locks it will be necessary to have a weir or tumbling bay at one side, to be of such capacity as to allow the river water to pass freely over, and not to exceed in time of flood, a greater rise than a two feet head. The face and sides of the weir to be built of well jointed masonry set in good water cement.—(*see* detailed Plan of Lock and Weir.) Plan No. 20.

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(5.)—Report of Mr. Rhodes on the Lower Brusna River.

New Bridge will require to be taken down and rebuilt, and it may be supported from the weir (as per sketch). I propose all the locks to be on the north side, as also the towing path, which can be formed at a less expense, and a swivel bridge to be erected, both at New Bridge to connect the line of road from Banagher to Portumna, and smaller ones formed at the other locks for the convenience of the inhabitants residing on each side; it will also be necessary to build double abutments and a leafed swivel bridge on the new projected line of road from Banagher to Neenagh at Ballina Ford, but as this does not belong to the works on the canal, I have not prepared for it in the estimate.

In forming the bottom of the river course above the locks, it can easily be accomplished by beginning at the lower end of each reach, carrying the drainage along with the bottoming.

And for the lower part of the river, the water of which is level with the Shannon, the upper part of the bank can be taken off in the summer season, and the lower part, sides and bottom dredged, either with a small steam-engine, or performed by men with the bag and spoon. The soil being of a marly or loamy nature, a great quantity may be done at a little more than the common price for excavating, when once the men are trained a little.

Should the grand scheme of the reduction of Lough Derg take place, it would be of considerable advantage in relieving the callows and draining the bogs in this vicinity, also in forming and navigating this lower part of the river. This portion of the banks being upon so low a level that a towing-path would be required of sufficient elevation to be above the winter floods, all the way from the entrance near Hamilton's Lock to the first lock upon the Brusna, a distance of three miles, the line being so very circuitous that a great number of beacons must otherwise be erected, and the boats towed by steam power during the season of the floods.

For the drainage of the land on each side, and for the preservation of the river course, I should advise that a side drain be cut from one lock to the other, entering at the lower level at each lock, proper attention being paid to the construction of these outlets, so as to protect the river banks from injury, and prevent the sand, &c. washing in.

If it be found necessary to irrigate the lands on each side of the river, small sluices may be constructed at the outlets of the drains, which would dam up the water, so as to perform this office effectually at any season of the year.

The Brusna passes through the domain of Lord Rosse; but it appears not necessary at present to proceed with the works further up than Croghan bridge, this point being at so small a distance from Parsonstown, being only about half a mile. I should therefore propose to form a harbour near to this bridge for the reception of merchandize, with quays and cranes to facilitate the loading and unloading goods.—(*see* Plan.)

In performing the above proposed works, great facilities present themselves, by good limestone quarries being in the immediate vicinity, affording the supply of stone and lime for building the locks, weirs, quays, &c. &c., and for facing the embankments, which would reduce the expense of the work considerably, the principal part being for manual labour only; and as the labouring class in this part of the country appear much in want of employment, the present would be a salutary time for performing these operations.

Having taken a view of the surrounding country immediately beyond this, I find it of so promising a nature, that it appears by no means improbable, if this line of navigation once arrives at Parsonstown, that it will be then thought advisable to extend it further into the heart of the country in the direction of Roscrea.

The following Tables are the soundings taken along the river at every chain's length.

Thos. Rhodes,
Civil Engineer.

Limerick, 26 May 1832.

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(5).—Report of Mr. Rhodes on the Lower Brusna River.

SOUNDINGS commencing at the River Shannon, taken at every Chain's Length.
(Datum 6 ft. 9 in. on the Lower Sill of Hamilton's Lock.)

Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
9	0	18	0	17	0	14	0	3	0	3	0	3	8	4	6	6	9	4	0
12	0	18	0	16	0	17	0	3	0	3	0	3	9	4	9	5	0	4	0
12	0	18	0	14	0	13	0	3	6	4	1	4	3	8	0	5	6	2	3
13	6	16	0	14	0	14	0	4	9	2	10	4	6	4	9	6	0	3	0
13	0	17	0	12	0	15	0	3	3	3	0	4	4	5	9	4	6	4	9
10	0	16	0	14	0	10	0	3	0	2	9	5	6	5	0	4	3	3	9
13	0	16	0	14	0	12	6	3	0	3	3	4	9	4	9	5	0	4	9
14	0	17	0	13	0	13	0	3	0	3	2	4	9	4	9	4	7	4	9
14	0	17	0	12	0	10	0	2	6	7	0	4	9	4	0	5	0	3	9
14	0	18	0	12	0	12	0	2	6	3	3	4	6	4	0	3	9	4	6
18	0	17	6	11	0	12	0	2	9	5	4	3	6	4	4	4	6	5	9
18	0	17	0	4	0	10	0	2	0	5	9	3	2	7	9	4	6	4	6
17	0	16	0	5	0	11	0	2	0	3	6	3	4	5	6	3	9	6	0
15	6	17	0	4	6	10	0	4	0	3	9	2	6	5	0	5	9	5	0
12	0	17	0	6	0	10	0	7	0	3	6	4	9	5	6	6	6	5	9
13	6	17	6	7	0	9	0	3	0	3	6	7	6	5	9	4	6	3	6
14	6	17	0	13	0	7	0	2	3	3	6	4	6	3	6	6	3	4	3
16	0	17	6	13	0	(a)11	0	2	6	3	6	4	6	3	6	5	9	5	6
15	0	16	0	13	0	11	0	3	0	4	0	4	0	2	4	5	6	5	0
14	0	16	0	15	0	11	0	4	3	5	4	4	0	2	4	4	9	5	3
15	0	16	0	19	0	12	0	6	0	3	6	4	6	6	9	5	3	5	0
16	0	17	6	12	0	9	0	4	0	3	9	4	9	10	9	3	9	5	0
16	6	17	0	13	0	6	0	2	6	3	6	4	9	5	3	6	0	5	0
14	0	18	0	14	0	6	0	2	3	4	9	4	9	4	9	5	0	6	6
16	0	16	0	13	0	11	0	2	3	3	9	5	0	5	9	4	0	5	3
15	0	16	0	13	0	13	0	3	9	3	10	4	4	5	6	3	3	4	9
15	0	16	0	13	0	6	0	4	6	3	9	3	9	5	9	3	9	6	0
9	0	15	0	9	6	4	0	4	0	8	6	3	6	5	0	5	9	4	0
10	0	18	0	6	0	4	0	2	4	4	3	3	0	4	9	7	0	3	9
14	0	16	6	6	6	4	0	2	6	3	6	3	6	4	6	4	9	4	6
13	6	16	0	11	0	3	9	2	9	2	10	3	0	6	0	4	9	3	6
13	0	15	0	14	0	3	9	2	9	3	3	2	9	6	0	5	6	4	6
14	0	12	0	14	0	3	9	4	3	3	6	4	0	4	9	5	6	4	6
14	0	15	0	12	0	3	0	5	6	4	6	4	9	6	0	6	0	4	6
12	0	13	0	14	0	3	0	3	10	4	7	4	9	4	0	5	3	3	6
13	0	15	0	12	0	2	3	5	2	4	3	4	2	5	6	5	3	3	6
13	0	14	0	17	0	5	6	2	6	3	6	4	2	4	9	5	3	3	0
14	6	14	0	16	0	3	0	2	6	3	6	4	2	5	6	5	6	3	3
14	0	13	0	13	0	7	0	2	3	4	0	8	0	3	9	3	6	3	3
15	0	12	0	10	0	3	0	2	0	3	9	5	0	4	9	3	6	2	9
15	0	12	0	11	0	3	6	2	0	4	3	5	4	6	0	4	9	2	9
17	0	11	0	8	0	2	9	3	2	3	9	4	6	6	2	4	0	2	6
22	0	7	0	12	0	3	0	1	6	6	3	5	6	4	0	3	9	2	6
22	0	6	0	13	0	3	0	4	3	4	3	4	6	4	3	3	6	2	3
22	0	8	0	18	0	4	0	2	9	3	3	6	6	6	6	3	6	2	6
12	6	9	0	10	0	4	0	3	2	5	0	4	6	4	0	3	3	2	9
10	6	16	0	12	0	3	6	3	6	3	6	4	3	3	6	3	9	(b)2	0
18	0																		

(a) Captain O. Moore. (b) New Bridge.

SOUNDINGS from New Bridge to Melville Mill.

Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
3	6	5	3	5	6	3	0	6	6	7	6	2	6	0	9	1	6	3	3
3	0	6	3	5	0	3	6	7	3	5	6	2	0	0	9	1	6	2	6
2	0	4	9	4	6	6	0	7	3	4	3	0	9	0	9	1	6	3	10
5	6	5	6	4	3	4	3	5	3	4	9	2	0	0	9	2	6	2	0
4	6	5	6	4	0	6	3	6	6	3	6	0	9	1	3	2	0	3	0
5	0	5	3	6	9	5	0	3	9	3	6	2	0	1	6	2	0	1	0
6	9	4	6	8	0	5	0	5	0	3	9	2	6	1	6	2	0	1	3
7	6	7	3	5	3	4	6	7	0	2	3	2	6	1	6	2	3	1	3
7	0	5	3	2	6	4	6	4	6	2	3	2	6	1	9	2	0	1	6
5	6	5	3	4	9	3	0	4	9	3	0	2	6	2	0	2	9	(a)1	3
6	0	4	3	3	9	2	3	3	6	2	9	2	6	1	6	2	0	(b)1	3
5	0	5	3	4	0	3	0	4	0	2	3								

(a) Pent Stock. (b) Melville Mill.

No. 17.

(5.)—Report of Mr. Rhodes on the Lower Brusna River.

Soundings from the Head of Melville Mill Dam upwards to Croghan Bridge.

Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.	Ft.	in.
3	0	8	0	6	0	2	9	5	3	2	0	5	3	5	0	4	3
3	3	6	9	4	3	4	6	5	9	3	0	6	0	5	0	4	0
4	3	7	3	5	0	3	0	5	9	3	0	5	3	4	6	4	0
4	6	7	6	4	0	5	9	5	0	4	0	5	6	4	0	4	0
3	9	3	9	3	3	6	3	5	0	5	4	5	6	3	9	4	0
4	0	4	0	4	6	4	9	5	9	6	6	5	0	4	3	3	6
4	3	4	3	4	0	3	6	6	0	8	0	5	0	4	3	2	0
4	6	5	6	3	3	4	3	4	6	7	6	4	0	4	3	1	9
5	3	4	3	3	6	7	0	5	9	6	3	5	4	4	4	2	6
6	0	4	3	4	9	6	9	5	3	5	6	5	0	4	3	2	6
5	6	4	6	3	9	2	9	5	6	5	9	5	4	4	3	1	6
4	9	4	6	4	0	2	0	5	9	4	6	5	0	3	9	2	8
4	9	3	0	4	3	2	0	4	6	8	3	4	0	4	0	2	9
5	3	5	9	4	0	6	3	3	3	6	0	4	0	4	3	3	3
6	3	5	3	3	3	4	0	3	9	5	6	4	6	4	3	3	6
5	3	5	3	4	3	4	9	4	6	5	9	4	0	4	0	3	3 (a)
3	6	5	9	2	9	4	9	4	6	5	3	4	3	4	3	(a) Croghan Bridge.	
4	0	6	3	5	9	4	9	3	0	5	0	4	0	4	0		

Note:—The water being 3 ft. 3 in. deep at Croghan Bridge, its surface was 3 ft. from the springing of the south side arch.

Estimate for making the Lower Brusna River navigable from the Shannon to Parsonstown, according to the accompanying Plans and Report.

		£.	s.	d.
164,560 yards of excavation	a' 5*d.*	3,428	6	8
4 locks with weirs, timber gates, &c. complete, with swivel bridges, &c. for foot passengers, and platforms for passing over the weirs, as per detailed drawings	a' 3,750*l.*	15,000	–	–
4 lock-keepers' houses		400	–	–
11 culverts for outlets of drains in the first two miles		132	–	–
25,520 yards run back-drains	a' 3*d.*	319	–	–
15,840 yards gravelling to towing-path	a' 9*d.*	594	–	–
Taking down and rebuilding New Bridge, with iron arch, as shown in the detailed drawing		1,000	–	–
		20,873	6	8
Add 10 per cent. for superintendence and contingencies		2,087	4	–
	£.	22,960	10	8

Harbour at Parsonstown:

Yards.		£.	s.	d.
6,000 of excavation	a' 5*d.*	125	–	–
370 rubble wall	a' 6*d.*	111	–	–
Storehouses and cranes		2,050	–	–
31,000 post and railing for fence	a' 9*d.*	1,162	–	–
Quicksets to ditto		500	–	–
		3,948	–	–
Add 10 per cent. for superintendence and contingencies		394	16	–
	£.	4,342	16	–

Note:—In the above Estimate no allowance is made for the purchase of land, as it is understood that the proprietors are willing to give it up without consideration.

Thos. Rhodes.

No. 17.
(5.)—Report of Mr. Rhodes on the Lower Brusna River.

ESTIMATE of making a Canal and part of the River Brusna navigable from the Shannon to Parsonstown.

			£.	s.	d.
	Lock:				
Yards, 3,889	cube, digging in foundations, coffer-dams - -	a' 5 *d.*	81	-	5
600	puddle, at back of walls - - - - - -	a' 6 *d.*	15	-	-
	Piling, waling, bolts and spikes for sills, and end of invert -		45	-	-
Cube feet, 10,714	of ashlar in hollow quoins, square ditto, chamber of lock, inverted arch, &c. set in water cement - - -	a' 10 *d.*	446	8	4
1,300	tooled and dowelled coping - - - - - -	a' 1 *s.*	65	-	-
Yards, 884	rubble work in foundation, back of walls, contreforts, &c.	a 6 *s.*	265	4	-
2	pairs of timber gates - - - - - - - - -		440	-	-
	For one Lock - - -		1,357	12	9 3
	There are three Locks required similar to this - - -	£.	4,072	18	3
3	accommodation swivel bridges - - - -	£. 900			
	Extra retaining walls for the one at New Bridge -	- 100			
			1,000	-	-
Cube Yards. 138,600	excavation in the entire length of canal, making slopes, forming banks, &c. - - - - - - - -	a' 5 *d.*	2,887	10	-
23,100	puddle on each side - - - - - - -	a' 6 *d.*	577	10	-
	Taking off some of the bends and deepening the lower part of the river by the dredging-machine, from the Shannon to the first lock - - - - - - - - - -		400	-	-
23,760	forming and deepening channel of old river, from Melville Mill to Croghan Bridge - - - - -	a' 5 *d.*	495	-	-
	Lock and weir near Dovegrove - - -	£. 3,000 - -			
	And making alteration in mill-dam at Melville -	492 5 1			
			3,492	5	1
11	culverts in the first reach from the Shannon - - - - -		132	-	-
4	Lock-keepers' houses - - - - - - - - -		400	-	-
Yards. 25,520	run back-drains - - - - - - -	a' 3 *d.*	319	-	-
15,840	gravelling to towing-path - - - - - -	a' 9 *d.*	594	-	-
			14,370	3	4
	Add 10 per Cent. for superintendence and contingencies		1,437	-	4
	Total Amount for forming the navigable communication -		15,807	3	8
	Harbour at Parsonstown, &c. - - - - - - - -	£.	4,342	16	-

Limerick, 26 May 1832.

Thomas Rhodes.

PLANS.

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4.—Sketch of Fergus *p.* 28

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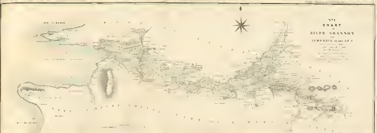
No 1
CHART
of
RIVER SHANNON
from
LIMERICK to the SEA